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Richardson County Test Hole Logs

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RICHARDSON COUNTY Test-Hole Logs

Raymond R. Burchett and Frank A. Smith

**Nebraska Water Survey
Test-Hole Report No. 74**

**Conservation and Survey Division
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln**



January 1990



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UNIVERSITY OF NEBRASKA-LINCOLN

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The Conservation and Survey Division of the University of Nebraska is the agency designated by statute to investigate and interpret the geologically related natural resources of the state, to make available to the public the results of these investigations, and to assist in the development and conservation of these resources.

The division is authorized to enter into agreements with federal agencies to engage in cooperative surveys and investigations in the state. Publications of the division and the cooperating agencies are available from the Conservation and Survey Division, University of Nebraska, Lincoln, Nebraska 68588-0517.

The Conservation and Survey Division provides information and educational programs to all people without regard to race, color, national origin, sex or handicap.

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INTRODUCTION

In 1930, the Conservation and Survey Division of the University of Nebraska and the U.S. Geological Survey began a program of cooperative groundwater studies in Nebraska. Since then test drilling by use of rotary drilling equipment has been an integral part of that program. This report contains logs of all the test holes drilled in the county under the program as well as those drilled by the Conservation and Survey Division with financial assistance from other government agencies.

The map in this report (figure 1) shows the location of all test holes drilled in the Richardson County since 1930.

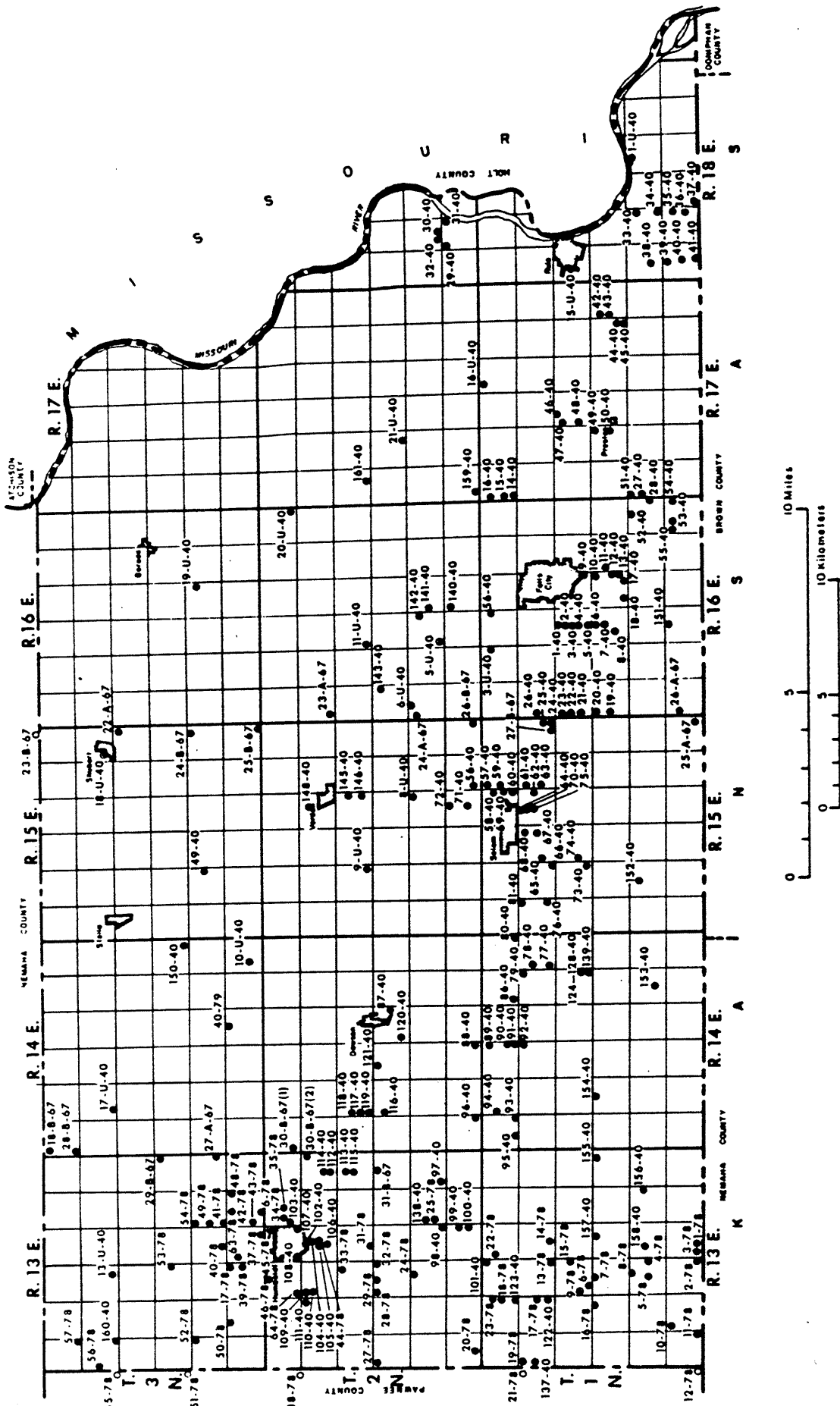
Present techniques of test-hole logging and sampling include use of drilling mud suitable to drilling conditions, timing by stopwatch of the drilling of each 5-foot increment of depth, and removal of all cuttings from the test hole at intervals of 5 feet or less. During the drilling of the hole, cuttings from each interval are examined immediately; samples representing each 5-foot interval and each recognizable change in material are retained. After samples are washed, they are described lithologically and the color is evaluated by comparison with standard color charts. The samples then are dried, stored, and cataloged. Beginning in September 1951, the test holes have been logged electrically. All samples are processed and kept on open file in the offices of Conservation and Survey Division, 113 Nebraska Hall, University of Nebraska-Lincoln, 68588.

This publication is one of a series being issued to make more readily available the record of test holes drilled since 1930. The series of publications is made on a county basis and includes, with some exceptions, logs of all test holes drilled in each of the counties. The logs have not been reviewed for conformance with editorial standards and nomenclature.

The method whereby the altitude of the land surface at testhole sites was determined is indicated in the heading of each log, as follows: a = altimeter, h = hand leveling, i = spirit leveling, t = estimated from topographic map.

The test-hole records accurately reflect subsurface conditions only at the locations where the test holes were drilled. Interpretive data reflecting probable subsurface conditions between test-holes are being compiled for publication in county reports and are available for inspection in the office of the Conservation and Survey Division.

Each test hole is identified by a number assigned in the field (for example #3-B-67, #41-79), and most are also identified by a number indicating its location within the land divisions of the U.S. Bureau of Land Management's survey of Nebraska. Location numbers of test holes east of the 6th principal meridian, which passes through Columbus in a north-south direction, are preceded by the capital letter A; those west of the principal meridian have no preceding letter. The first numeral indicates the township, the second the range, and the third the section. As shown in figure 2, the letters that follow the section number indicate the location of the test hole within the section, the first letter indicating the quarter section and the second letter indicating the quarter-quarter section. The letters A, B, C, and D are applied in counterclockwise direction beginning with A in the northeast quadrant. The last numeral is the serial number of the test hole within the quarter-quarter section. No number is shown unless more than one test hole is within the given quarter-quarter section.



- Test hole description published in this report
- Test hole description published in other report

Fig. 1.. Test-hole location map of Richardson County.

A = NE 1/4
 B = NW 1/4
 C = SW 1/4
 D = SE 1/4
 1 Section =
 1 Mile² =
 640 Acres

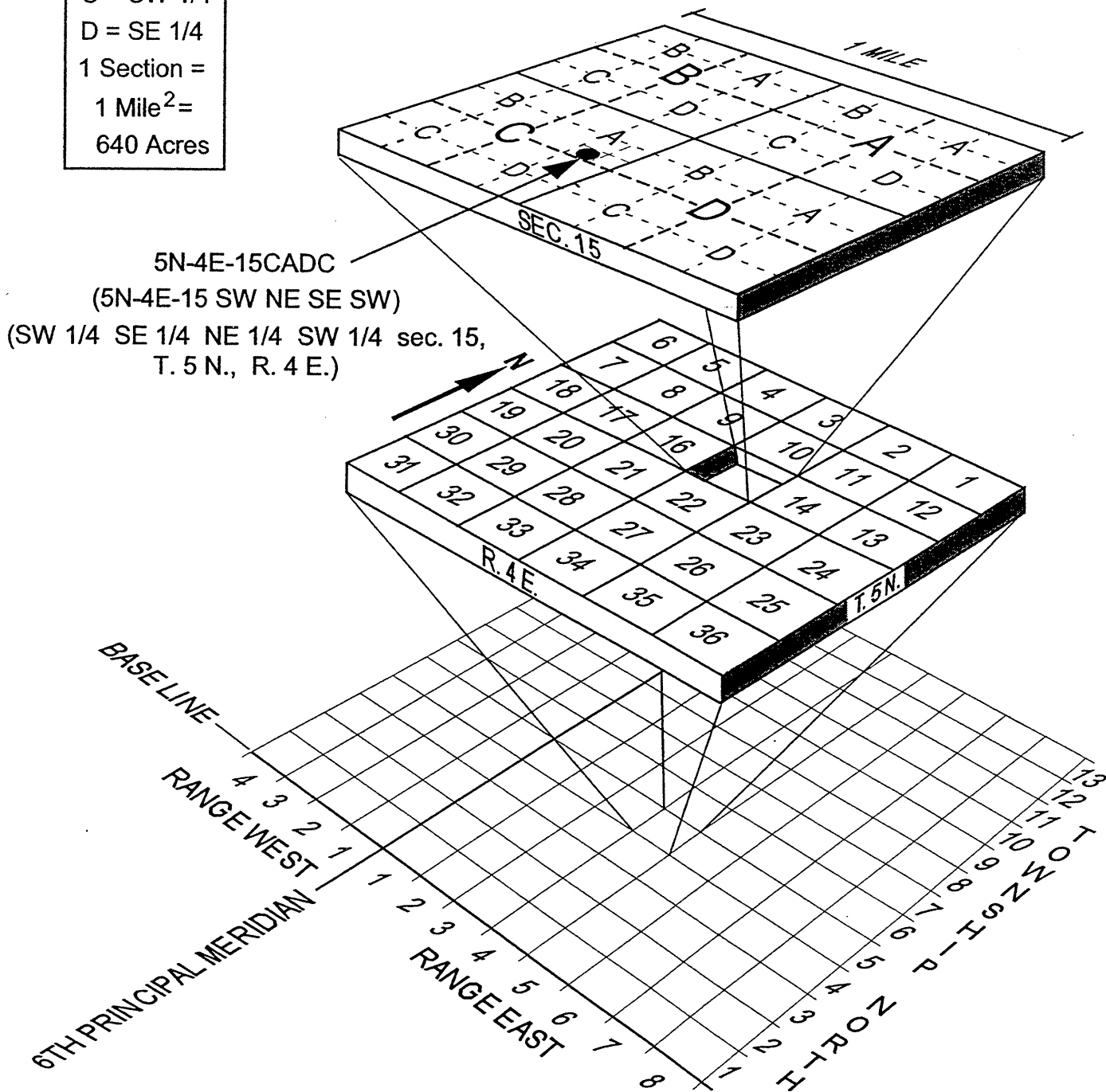


Fig. 2. System for identifying test-hole according to its location.

**Richardson County
Test-Hole Table of Contents**

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Twp Rge Sec	Number		
01N 13E 03BCBC	22-78	1
01N 13E 04BBCB	23-78	3
01N 13E 04AAAA	101-40	5
01N 13E 05DAAA	18-78	6
01N 13E 05DDDD	123-40	8
01N 13E 05AADD	135-40	9
01N 13E 07BBBB	19-78	10
01N 13E 08DAAA	17-78	12
01N 13E 08DADD	122-40	14
01N 13E 09DCDD	13-78	15
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01N 13E 24AABB	155-40	30
01N 13E 26ADDA	156-40	31
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01N 13E 28DAAB	04-78	33
01N 13E 28BDDD	05-78	35
01N 13E 28BAAA	08-78	36
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01N 13E 32BBBB	10-78	40
01N 13E 33DDDD	02-78	41
01N 13E 34CDCC	01-78	43
01N 13E 34CCDC	03-78	44
01N 14E 12CCBB	77-40	46
01N 14E 01DDDD	80-40	47
01N 14E 04AADD	89-40	48
01N 14E 04DAAA	90-40	49
01N 14E 04DDAA	91-40	50
01N 14E 05BCBC	94-40	51
01N 14E 06DDDD	93-40	52
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01N 14E 09AADD	92-40	54
01N 14E 11AAAA	79-40	55
01N 14E 11BBBB	86-40	56
01N 14E 12BCCB	78-40	57
01N 14E 14DADD	124-40	58
01N 14E 14DADD	125-40	59

[illegible]

03N 15E 13AAAA	22-A-67	. . . . .	306
03N 15E 25AABA	24-B-67	. . . . .	309
03N 15E 29ADCC	149-40	. . . . .	312
03N 15E 36DDDD	25-B-67	. . . . .	313
03N 16E 27ADAD	19-U-40	. . . . .	316

Test-holes are arranged in this publication by township, range and section.

Test Hole #22-78
1N 13E 3bcbc
Richardson County

Location: SW NW SW NW sec. 3, T. 1 N., R. 13 E., 1,724 feet south of
north section line, and 49 feet east of west section line.
Ground elevation: 975.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Sand, very fine, brown, silty.....	5.0	30.0
Sand and gravel, very fine to coarse, interbedded with silt, brown.....	30.0	34.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Willard Formation:		
Shale, medium gray.....	34.0	35.0
Emporia Formation:		
Elmont Member:		
Limestone, light gray, very finely crystalline to dense, contains algal material.....	35.0	36.1
Shale, greenish gray, mottled with gray.....	36.1	39.0
Limestone, light gray, very finely crystalline, contains pyrite.....	39.0	39.5
Harveyville Member:		
Shale, medium gray, mottled with olive.....	39.5	44.4
Reading Member:		
Limestone, medium to dark gray, very finely crystalline, contains brachiopods.....	44.4	47.4
Shale, medium to dark gray.....	47.4	48.0
Limestone, bluish gray, very finely crystalline, contains brachiopods, algal material, pyrite.....	48.0	49.5
Auburn Formation:		
Shale, medium gray.....	49.5	52.3
Shale, greenish gray.....	52.3	53.0
Shale, reddish brown.....	53.0	58.0
Shale, olive.....	58.0	61.0
Shale, light to medium gray.....	61.0	66.0
Shale, medium gray.....	66.0	77.5
Wakarusa Formation:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	77.5	80.5
Soldier Creek Formation:		
Shale, greenish gray.....	80.5	85.0
Shale, medium gray.....	85.0	90.8

Burlingame Formation:**South Fork Member:**

Limestone, cream, irregularly crystalline, contains algal material.....	90.8	94.0
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Winnebago Member:

Shale, olive, mottled with gray.....	94.0	96.0
Shale, medium to dark gray.....	96.0	99.5

Taylor Branch Member:

Limestone, medium gray, very finely crystalline.....	99.5	100.8
Shale, medium to dark gray.....	100.8	102.7
Limestone, bluish gray, pebbly texture, contains brachiopods, algal material.....	102.7	103.5
Shale, medium gray.....	103.5	104.9
Limestone, light tannish gray, very finely crystalline, contains dark brown inclusions.....	104.9	106.2
Shale, light greenish gray.....	106.2	107.7
Limestone, light gray, fine to very finely crystalline.....	107.7	108.2

Scranton Formation:**Silver Lake Member:**

Shale, maroon to red, mottled with light greenish gray.....	108.2	110.0
Shale, olive.....	110.0	112.0
Shale, medium gray.....	112.0	122.0
Shale, light to medium gray.....	122.0	126.3

Rulo Member:

Limestone, brownish gray, very finely crystalline, contains brachiopods, pyrite.....	126.3	126.5
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Cedarvale Member:

Shale, light to medium gray.....	126.5	134.0
Shale, light greenish gray.....	134.0	135.0

Happy Hollow Member:

Limestone, light greenish gray, very finely crystalline, interbedded with shale, red and green	135.0	141.5
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White Cloud Member:

Shale, reddish brown, mottled with gray, green, olive.....	141.5	143.0
Shale, greenish gray, mottled with olive.....	143.0	146.0
Shale, light to medium gray, interbedded with siltstone, gray.....	146.0	152.0

Test Hole #23-78
1N 13E 4bbcb
Richardson County

Location: NW SW NW NW sec. 4, T. 1 N., R. 13 E., 750 feet south of
north section line, and 10 feet east of west section line.
Ground elevation: 977.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	3.0
Clay, grayish brown.....	3.0	23.0
Clay, dark gray, sandy.....	23.0	28.0
Sand and gravel, fine to very coarse.....	28.0	42.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Scranton Formation:		
Silver Lake Member:		
Shale, medium gray.....	42.0	44.0
Rulo Member:		
Limestone, brownish gray, very finely crystalline, contains brachiopods and pyrite.....	44.0	44.1
Cedarvale Member:		
Shale, medium gray.....	44.1	51.0
Shale, light greenish gray.....	51.0	52.0
Shale, reddish brown.....	52.0	55.0
Happy Hollow Member:		
Limestone, light greenish gray, very finely crystalline, interbedded with shale, red, green...	55.0	56.2
White Cloud Member:		
Shale, light greenish gray.....	56.2	56.5
Shale, reddish brown, mottled with olive.....	56.5	58.0
Shale, reddish brown.....	58.0	62.0
Shale, light gray.....	62.0	75.0
Limestone, dark gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	75.0	75.5
Shale, light gray, silty, sandy.....	75.5	103.5
Claystone, dark brown.....	103.5	103.7
Shale, light gray, silty.....	103.7	117.0
Shale, light gray, silty, sandy.....	117.0	127.0
Shale, light gray, silty, sandy, interbedded with claystone, dark brown.....	127.0	132.0
Shale, light gray, silty.....	132.0	146.2
Howard Formation:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, fusulinids, pyrite, black inclusions.....	146.2	153.0

Severy Formation:

Shale, light gray.....	153.0	154.0
Shale, medium to dark gray.....	154.0	155.0
Coal, black.....	155.0	156.5
Shale, light to medium gray.....	156.5	158.2
Sandstone, light gray, very finely grained, lime cemented, contains black, carbonaceous material...	158.2	159.1
Shale, light gray, silty.....	159.1	167.0

Test Hole #101-40
1N 13E 4aaaa
Richardson County

Location: NE corner, sec. 4, T. 1 N., R. 13 E.

Ground elevation: 969.3 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 18.75 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, clayey, dark brownish gray.....	0.0	4.0
Clay, silty, brownish gray.....	4.0	10.0
Sand, clayey, buff.....	10.0	18.0
Silt, bluish gray to greenish gray.....	18.0	36.0
Gravel, gray, fine to coarse.....	36.0	39.0
Gravel, coarse, contains limestone pebbles and fragments.....	39.0	42.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, gray.....	42.5	42.7

Test Hole #18-78
1N 13E 5daaa
Richardson County

Location: NE corner SE sec. 5, T. 1 N., R. 13 E., 2,642 feet south of north section line, and 8 feet west of east section line.

Ground elevation: 980.0 ft (Humboldt SW 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	3.0
Clay, silty, sandy, brown.....	3.0	23.0
Clay, silty, sandy, light gray.....	23.0	26.0
Clay, silty, greenish gray.....	26.0	29.0
Clay, silty, brown.....	29.0	32.0
Sand and gravel, fine to very coarse, contains reworked shell fragments.....	32.0	44.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Burlingame Formation:		
Taylor Branch Member:		
Shale, light gray.....	44.0	45.0
Limestone, light to medium gray, very fine to coarse crystalline.....	45.0	45.7
Scranton Formation:		
Silver Lake - Cedarvale Members:		
Shale, olive.....	45.7	46.5
Limestone, light gray, very finely crystalline.....	46.5	47.0
Shale, medium to dark gray.....	47.0	52.0
Shale, light to medium gray.....	52.0	57.0
Shale, light gray, interbedded with limestone, gray, dense.....	57.0	62.0
Shale, light gray.....	62.0	70.0
Shale, reddish brown.....	70.0	73.0
Shale, light greenish gray.....	73.0	75.0
Shale, reddish brown.....	75.0	79.5
Happy Hollow Member:		
Limestone, white with red staining, very finely crystalline, interbedded with sandstone, red, very finely grained.....	79.5	80.0
Shale, reddish brown.....	80.0	80.6
Limestone, white with red staining, very finely crystalline, interbedded with sandstone, red, very finely grained.....	80.6	81.0
White Cloud Member:		
Shale, light reddish brown.....	81.0	83.0
Shale, greenish gray.....	83.0	86.0

Shale, light gray, silty.....	86.0	92.0
Shale, light gray, silty, sandy.....	92.0	97.2
Limestone, medium to dark gray, irregularly crystalline, contains brachiopods, crinoids, bryozoans.....	97.2	98.0
Shale, light gray.....	98.0	107.0
Shale, medium gray, silty, sandy.....	107.0	122.0

Test Hole #123-40
1N 13E 5dddd
Richardson County

Location: SE SE SE SE sec. 5, T. 1 N., R. 13 E., approximately 75 feet west of east section line, and 75 feet north of southeast section corner.

Ground elevation: 984.05 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 9.07 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brownish gray.....	0.0	10.0
Clay, silty, buff.....	10.0	28.0
Clay, silty, gray.....	28.0	32.0
Gravel, red, fine to coarse.....	32.0	35.0
Gravel and shale fragments.....	35.0	39.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, very hard, dark gray.....	39.0	40.0

Test Hole #135-40
1N 13E 5aadd
Richardson County

Location: SE corner NE NE sec. 5, T. 1 N., R. 13 E., approximately
 1,320 feet south of NE corner of section, 190 feet
 south of Nemaha River.

Ground elevation: 974.8 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 23.38 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	4.0
Clay, gray, contains iron stain.....	4.0	8.0
Clay, gray to buff.....	8.0	22.0
Clay, silty, dark bluish gray.....	22.0	36.0
Silt, sandy, gray, contains shell fragments.....	36.0	40.0
Gravel, gray, fine to coarse.....	40.0	42.0
Gravel, gray, coarse, contains limestone chips and pebbles.....	42.0	44.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, dark brownish gray, contains fossils.....	44.5	44.6

Test Hole #19-78
1N 13E 7bbbb
Richardson County

Location: NW corner sec. 7, T. 1 N., R. 13 E., 16 feet south of north section line, and 58 feet east of west section line.

Ground elevation: 1,010.0 ft (a) (Du Bois 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Clay, sandy, gravelly, yellowish brown.....	1.0	11.0
Clay, sandy, gravelly, yellow, mottled with olive...	11.0	16.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Soldier Creek Formation:		
Shale, olive.....	16.0	21.0
Shale, medium gray.....	21.0	23.0
Shale, light gray.....	23.0	24.5
Burlingame Formation:		
South Fork Member:		
Limestone, light gray, very finely crystalline, contains manganese staining, algal material.....	24.5	28.6
Winnebago Member:		
Shale, light gray, mottled with olive.....	28.6	31.0
Shale, medium gray.....	31.0	33.2
Taylor Branch Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods.....	33.2	34.3
Shale, medium to dark gray.....	34.3	38.0
Limestone, light tannish gray, very finely crystalline.....	38.0	39.2
Shale, light greenish gray, limy.....	39.2	40.2
Limestone, light gray, very finely crystalline, contains pyrite.....	40.2	41.0
Scranton Formation:		
Silver Lake Member:		
Shale, light gray.....	41.0	57.5
Rulo Member:		
Limestone, gray and brownish gray, very finely crystalline, contains brachiopods, crinoids.....	57.5	58.0

Cedarvale - White Cloud Members:

Shale, light gray.....	58.0	61.0
Shale, light greenish gray.....	61.0	68.0
Shale, light red, interbedded with greenish gray....	68.0	68.5
Shale, light greenish gray, mottled with olive.....	68.5	69.5
Shale, light greenish gray.....	69.5	72.0
Shale, light gray.....	72.0	82.0
Shale, light gray, silty.....	82.0	92.0

Test Hole #17-78
1N 13E 8daaa
Richardson County

Location: NE corner SE sec. 8, T. 1 N., R. 13 E., 2,649.0 feet south
of north section line, and 20 feet west of east section line.
Ground elevation: 986.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Clay, light brown.....	5.0	12.0
Clay, silty, light grayish brown.....	12.0	17.5
Clay, silty, dark gray.....	17.5	20.0
Clay, very silty, sandy, gravelly, brownish gray....	20.0	22.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Auburn Formation:		
Shale, light gray.....	22.0	27.0
Shale, light gray, interbedded with greenish gray...	27.0	33.2
Wakarusa Formation:		
Limestone, yellowish brown, finely crystalline, contains brachiopods.....	33.2	35.9
Soldier Creek Formation:		
Shale, olive.....	35.9	36.0
Shale, light gray.....	36.0	39.5
Shale, light gray, limy.....	39.5	42.0
Shale, light to medium gray.....	42.0	48.0
Burlingame Formation:		
South Fork Member:		
Limestone, cream, fine to very fine crystalline, contains glauconite, algal material.....	48.0	49.0
Winnebago Member:		
Shale, light greenish gray.....	49.0	50.0
Shale, olive, mottled with gray.....	50.0	53.0
Shale, light to medium gray.....	53.0	56.0
Taylor Branch Member:		
Limestone, light to medium gray, finely crystalline, contains pyrite.....	56.0	57.0
Shale, light to medium gray.....	57.0	59.0
Limestone, bluish gray, irregularly crystalline, contains brachiopods, algal material.....	59.0	61.5
Scranton Formation:		
Cedarvale Member:		
Shale, light gray, limy.....	61.5	63.0
Shale, medium to dark gray.....	63.0	65.0
Shale, light gray.....	65.0	80.2

Rulo Member:

Limestone, bluish gray, irregularly crystalline, contains crinoids, pyrite.....	80.2	81.0
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White Cloud Member:

Shale, light gray.....	81.0	85.0
Shale, very light gray to white, limy.....	85.0	87.0
Shale, light and dark greenish gray.....	87.0	92.0
Shale, light greenish gray, interbedded with limestone, greenish gray, dense.....	92.0	97.0
Shale, light greenish gray.....	97.0	100.0
Shale, light to medium gray.....	100.0	115.0
Shale, medium gray, silty.....	115.0	120.0
Shale, medium gray, silty, interbedded with sandstone, medium gray, very finely grained.....	120.0	135.0
Shale, medium gray, silty, contains black, carbonaceous material.....	135.0	141.5
Shale, medium gray, silty, interbedded with sandstone, medium gray, very finely grained.....	141.5	148.0

Test Hole #122-40
1N 13E 8dadd
Richardson County

Location: Center east line SE sec. 8, T. 1 N., R. 13 E.,
 approximately 1,320 feet north and 100 feet west of the southeast
 corner of section.

Ground elevation: 995.0 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 12.63 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, brownish gray.....	0.0	5.0
Clay, reddish brown.....	5.0	8.0
Clay, silty, gray with limonitic streaks.....	8.0	27.0
Sand, silty, gray.....	27.0	31.0
Gravel, reddish brown, fine to coarse, contains large pebbles below 35.0 ft, limestone chips below 39.0 ft.....	31.0	39.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, bluish gray.....	41.0	44.0
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Test Hole #13-78
1N 13E 9dcdd
Richardson County

Location: SE SE SW SE sec. 9, T. 1 N., R. 13 E., 33 feet north of
 south section line, and 1,366 feet west of east section line.
 Ground elevation: 1,120.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Stotler - Root Formations:		
French Creek Member:		
Shale, olive brown.....	1.0	11.0
Shale, olive gray.....	11.0	12.7
Shale, black.....	12.7	13.5
Shale, brown.....	13.5	14.0
Jim Creek Member:		
Limestone, medium gray, mottled with brown, finely crystalline, contains brachiopods.....	14.0	14.4
Friedrich - Dry Members:		
Shale, brown.....	14.4	14.8
Shale, light gray, contains limy nodules, brachiopods.....	14.8	16.0
Shale, light gray.....	16.0	19.0
Shale, reddish brown.....	19.0	22.8
Shale, light greenish gray, interbedded with limestone, tannish gray, dense.....	22.8	25.5
Shale, red, mottled with light green.....	25.5	27.0
Shale, reddish brown.....	27.0	39.0
Shale, olive.....	39.0	41.0
Shale, medium gray.....	41.0	62.2
Dover Member:		
Limestone, medium to dark gray, finely crystalline, contains brachiopods.....	62.2	63.0
Pillsbury Formation:		
Shale, light greenish gray, silty, sandy, limy.....	63.0	65.0
Shale, reddish brown.....	65.0	69.0
Shale, olive.....	69.0	71.0
Shale, medium gray.....	71.0	79.5
Zeandale Formation:		
Maple Hill Member:		
Limestone, bluish gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	79.5	81.4

Wamego Member:

Coal, black.....	81.4	81.6
Shale, light gray.....	81.6	89.0
Shale, medium gray.....	89.0	91.2

Tarkio Member:

Limestone, medium to dark gray, finely crystalline, contains glauconite, fusulinids, <u>Osagia</u>	91.2	92.0
Shale, light gray, mottled with reddish brown.....	92.0	93.3
Shale, reddish brown.....	93.3	95.0
Limestone, white to cream, finely crystalline, contains <u>Osagia</u> , glauconite, fusulinids.....	95.0	100.5

Willard Formation:

Shale, light greenish gray, interbedded with sandstone, tan, very finely grained.....	100.5	101.3
Shale, olive, mottled with gray and brown.....	101.3	103.0

Test Hole #14-78
1N 13E 10CDDD
Richardson County

Location: SE corner SW sec. 10, T. 1 N., R. 13 E., 25 feet north of
 south section line, and 2,614 feet east of west section line.
 Ground elevation: 1,050.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Pony Creek - Plumb Members:		
Shale, brownish gray.....	2.0	6.0
Shale, reddish brown.....	6.0	15.2
Shale, olive, mottled with gray.....	15.2	19.0
Nebraska City Member:		
Limestone, medium gray, finely crystalline, contains brachiopods.....	19.0	20.0
Root Formation:		
French Creek Member:		
Shale, olive brown.....	20.0	20.4
Coal, black.....	20.4	21.0
Shale, light gray.....	21.0	24.5
Shale, medium gray.....	24.5	26.5
Limestone, medium gray, finely crystalline, contains brachiopods and pyrite.....	26.5	27.1
Coal, black.....	27.1	27.2
Shale, light gray.....	27.2	36.0
Shale, medium gray.....	36.0	41.3
Jim Creek Member:		
Limestone, medium gray, finely crystalline, contains brachiopods.....	41.3	43.0
Friedrich Member:		
Shale, light gray.....	43.0	48.0
Shale, reddish brown.....	48.0	51.0
Shale, reddish brown, mottled with greenish gray....	51.0	51.5
Stotler Formation:		
Grandhaven Member:		
Limestone, cream and light gray, interbedded with shale, red.....	51.5	54.0

Dry Member:		
Shale, light greenish gray, limy.....	54.0	55.0
Shale, reddish brown.....	55.0	66.0
Shale, olive, mottled with gray.....	66.0	67.3
Shale, light to medium gray.....	67.3	91.6
Dover Member:		
Limestone, medium to dark gray, very finely crystalline, contains brachiopods and crinoids....	91.6	92.5
Pillsbury Formation:		
Shale, light greenish gray.....	92.5	95.5
Shale, reddish brown.....	95.5	99.0
Shale, olive.....	99.0	100.0
Shale, medium gray.....	100.0	112.0
Zeandale Formation:		
Maple Hill Member:		
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids, glauconites.....	112.0	113.2
Wamego Member:		
Shale, medium to dark gray.....	113.2	115.0
Limestone, bluish gray, irregularly crystalline, contains brachiopods and crinoids.....	115.0	115.4
Shale, light gray.....	115.4	119.0
Shale, medium gray.....	119.0	120.9
Tarkio Member:		
Limestone, dark gray, irregularly crystalline, pebbly texture, contains brachiopods and crinoids.	120.9	121.6
Shale, light gray.....	121.6	122.7
Shale, reddish brown.....	122.7	124.0
Shale, greenish gray.....	124.0	124.4
Limestone, cream, irregularly crystalline, contains fusulinids and <u>Osagia</u>	124.4	129.0
Willard Formation:		
Shale, light greenish gray.....	129.0	131.0
Shale, olive, mottled with red.....	131.0	133.0
Shale, light greenish gray.....	133.0	135.0
Shale, light to medium gray.....	135.0	137.0

Test Hole #9-78
1N 13E 16cbbc
Richardson County

Location: SW NW NW SW sec. 16, T. 1 N., R. 13 E. 2,040 feet north of
 south section line, and 15 feet east of west section line.
 Ground elevation: 1,040.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Clay, reddish brown, sandy and gravelly below 5.0 ft	2.0	12.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Pillsbury Formation:		
Limestone, reddish brown, irregularly crystalline, contains brachiopods.....	12.0	12.5
Shale, olive.....	12.5	15.5
Shale, red.....	15.5	20.0
Shale, olive.....	20.0	21.3
Shale, medium gray.....	21.3	32.1
Zeandale Formation:		
Maple Hill Member:		
Limestone, bluish gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	32.1	33.5
Wamego Member:		
Coal, black.....	33.5	33.7
Shale, light greenish gray.....	33.7	34.2
Sandstone, greenish gray, contains very fine mica...	34.2	36.8
Shale, light greenish gray.....	36.8	37.8
Shale, light greenish gray, contains very fine mica, carbonaceous material.....	37.8	43.0
Shale, light gray.....	43.0	43.5
Shale, medium to dark gray.....	43.5	46.5
Tarkio Member:		
Limestone, medium to dark gray, finely crystalline, contains brachiopods, crinoids, and pyrite.....	46.5	47.3
Shale, light greenish gray, mottled with red.....	47.3	48.8
Limestone, cream, finely crystalline, contains <u>Osagia</u> , fusulinids, interbedded with shale, light greenish gray.....	48.8	54.5
Willard Formation:		
Shale, light greenish gray.....	54.5	56.0
Shale, light greenish gray, interbedded with red....	56.0	58.0

Test Hole #15-78
1N 13E 16adad
Richardson County

Location: SE NE SE NE sec. 16, T. 1 N., R. 13 E., 1,670.0 feet south
of north section line, and 26 feet west of east section line.
Ground elevation: 1,090.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Clay, sandy, brown.....	1.0	7.9
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, dark yellow, very finely crystalline, contains brachiopods, crinoids.....	7.9	8.1
Pony Creek - Plumb Members:		
Shale, olive gray, mottled with yellow.....	8.1	13.4
Limestone, yellowish brown, highly weathered, contains algal material.....	13.4	13.6
Shale, light greenish gray.....	13.6	15.5
Shale, reddish brown.....	15.5	21.0
Shale, olive gray.....	21.0	22.0
Shale, medium gray.....	22.0	23.7
Nebraska City Member:		
Limestone, medium to dark gray, finely crystalline, contains brachiopods, crinoids.....	23.7	25.5
Root Formation:		
French Creek Member:		
Coal, black.....	25.5	25.7
Shale, light gray.....	25.7	31.5
Shale, light gray, limy.....	31.5	31.9
Shale, light gray, mottled with black, contains traces of coal.....	31.9	32.1
Shale, light gray.....	32.1	38.0
Shale, medium gray.....	38.0	42.0
Shale, medium gray, mottled with dark gray.....	42.0	45.9
Jim Creek Member:		
Limestone, light to medium gray, contains brachiopods.....	45.9	46.2
Friedrich Member:		
Shale, light gray.....	46.2	51.5
Shale, reddish brown.....	51.5	55.1

Stotler Formation:**Grandhaven Member:**

Limestone, light greenish gray, very finely crystalline, contains brachiopods.....	55.1	58.2
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Dry Member:

Shale, light greenish gray.....	58.2	59.2
Shale, reddish brown.....	59.2	71.0
Shale, light gray, mottled with olive.....	71.0	72.0
Shale, medium gray.....	72.0	77.0
Shale, light to medium gray.....	77.0	82.0
Shale, light gray.....	82.0	94.7

Dover Member:

Limestone, medium to dark bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	94.7	95.7
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Pillsbury Formation:

Shale, light greenish gray.....	95.7	97.0
Shale, olive, mottled with greenish gray.....	97.0	99.0
Shale, reddish brown, mottled with greenish gray and olive.....	99.0	102.0
Shale, olive, mottled with medium gray.....	102.0	104.0
Shale, medium gray.....	104.0	107.0

Test Hole #136-40
1N 13E 18bcdd
Richardson County

Location: Center south line NW, sec. 18, T. 1 N., R. 13 E., 2,640 feet south and 1,320 feet east of northwest corner of section on north edge of road.

Ground elevation: 997.72 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 14.65 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	3.0
Clay, grayish brown to brown.....	3.0	25.0
Clay, dark gray with green tint.....	25.0	38.0
Silt, sandy, gray.....	38.0	42.0
Gravel, fine to coarse, contains large limestone pebbles, fragments, fusulinid fossils.....	42.0	46.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, sandy, dark gray, contains mica.....	46.0	49.0

Test Hole #16-78
1N 13E 20aaba
Richardson County

Location: NE NW NE NE sec. 20, T. 1 N., R. 13 E., 11 feet south of
north section line, and 895 feet west of east section line.
Ground elevation: 1,087.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Clay, silty, sandy, gravelly, reddish brown.....	2.0	7.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Tarkio Member:		
Limestone, pale yellow, finely crystalline, highly weathered, contains <u>Osagia</u> , fusulinids, crinoids	7.0	11.0
Willard Formation:		
Shale, olive, mottled with yellow, brown, red.....	11.0	13.0
Shale, light olive.....	13.0	19.0
Shale, medium gray.....	19.0	41.9
Emporia Formation:		
Elmont Member:		
Limestone, brownish gray, fine to very finely crystalline, contains brachiopods, fusulinids.....	41.9	44.2
Shale, medium gray.....	44.2	45.2
Limestone, gray, fine to very finely crystalline, contains brachiopods, crinoids, bryozoans, pyrite.	45.2	46.5
Shale, light greenish gray.....	46.5	47.1
Limestone, light brown, finely crystalline, contains brachiopods.....	47.1	47.5
Harveyville Member:		
Shale, light greenish gray.....	47.5	49.0
Shale, medium gray.....	49.0	52.0
Reading Member:		
Limestone, medium gray, finely crystalline.....	52.0	54.5
Shale, medium gray.....	54.5	54.7
Limestone, medium gray, fine to very finely crystalline, contains brachiopods, crinoids.....	54.7	55.5
Limestone, medium gray, finely crystalline, interbedded with shale, gray.....	55.5	55.9
Shale, medium gray.....	55.9	56.0
Limestone, light gray, very finely crystalline, bluish gray, irregularly crystalline, contains algal material.....	56.0	57.0

Auburn Formation:		
Shale, light to medium gray, limy.....	57.0	62.3
Limestone, light gray, finely crystalline, interbedded with shale, greenish gray.....	62.3	63.0
Shale, light greenish gray.....	63.0	70.0
Shale, medium gray.....	70.0	80.0
Wakarusa Formation:		
Limestone, light gray, irregularly crystalline, contains brachiopods, fusulinids, bryozoans.....	80.0	83.6
Soldier Creek Formation:		
Shale, medium gray.....	83.6	90.0
Shale, light greenish gray.....	90.0	93.0
Burlingame Formation:		
South Fork Member:		
Limestone, cream and light tannish gray, fine to very finely crystalline, contains algal material..	93.0	96.0
Winnebago Member:		
Shale, light greenish gray, mottled with olive.....	96.0	100.0
Shale, medium gray.....	100.0	102.0
Taylor Branch Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods.....	102.0	103.4
Shale, medium gray.....	103.4	104.5
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, pyrite.....	104.5	105.6
Shale, medium gray.....	105.6	107.0
Limestone, light gray, very finely crystalline, contains brachiopods.....	107.0	107.5
Scranton Formation:		
Shale, light greenish gray.....	107.5	111.0
Shale, light to medium gray.....	111.0	128.5
Shale, light greenish gray, mottled with dark greenish gray.....	128.5	140.0
Siltstone, medium gray.....	140.0	140.2
Shale, light greenish gray, silty.....	140.2	141.0
Shale, medium gray, silty, sandy.....	141.0	147.0
Shale, medium gray, interbedded with siltstone, greenish gray.....	147.0	152.5
Siltstone, medium gray, interbedded with sandstone, light greenish gray, contains mica.....	152.5	156.2
Sandstone, light greenish gray, limy.....	156.2	160.0
Silt, medium gray, sandy.....	160.0	178.0
Sandstone, light gray, very finely grained, limy, contains black, carbonaceous material.....	178.0	180.5
Silt, medium gray to light greenish gray, interbedded with sandstone, medium gray, very fine grained.....	180.5	197.0

Test Hole #6-78
1N 13E 21bbbb
Richardson County

Location: NW NW NW NW sec. 21, T. 1 N., R. 13 E., 4 feet south of
north section line, and 282 feet east of west section line.
Ground elevation: 1,117.0 feet (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	4.0
Permian System - Big Blue Series - Admire Group:		
Onaga Formation:		
Shale, reddish brown.....	4.0	5.0
Shale, pale olive.....	5.0	10.0
Shale, pale olive, mottled with yellow.....	10.0	18.0
Shale, medium gray, mottled with gray, thin.....	18.0	21.0
Shale, reddish brown.....	21.0	21.6
Limestone, dark yellowish brown, medium crystalline, contains manganese staining.....	21.6	22.6
Shale, reddish gray.....	22.6	24.2
Shale, pale olive, mottled with yellow and gray.....	24.2	25.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, pale yellow, finely crystalline, manganese staining, contains brachiopods.....	25.5	28.0
Pony Creek Formation:		
Plumb Member:		
Shale, olive.....	28.0	31.0
Shale, medium gray.....	31.0	32.7
Shale, black, contains coal, soft.....	32.7	32.9
Shale, pale greenish gray.....	32.9	34.0
Shale, reddish brown.....	34.0	40.0
Shale, pale olive gray.....	40.0	40.3
Shale, medium gray.....	40.3	41.2
Limestone, light tannish gray, finely crystalline, contains brachiopods.....	41.2	43.4
Shale, gray, contains black carbonaceous material...	43.4	44.0
Shale, light gray.....	44.0	49.6
Kansas City Member:		
Limestone, dark gray, finely crystalline, impure, contains brachiopods.....	49.6	50.7

Root Formation:

French Creek Member:

Coal, black.....	50.7	50.9
Shale, light gray.....	50.9	60.0
Shale, medium gray.....	60.0	64.4

Jim Creek Member:

Limestone, light to medium gray, finely crystalline, contains brachiopods.....	64.4	66.5
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Friedrich Member:

Shale, light gray.....	66.5	67.0
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Test Hole #7-78
1N 13E 21baab
Richardson County

Location: NW NE NE NW sec. 21, T. 1 N., R. 13 E., 8 feet south of
north section line, and 2,100 feet east of west section line.
Ground elevation: 1,177.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Permian System - Big Blue Series - Council Grove Group:		
Foraker Formation:		
Hughes Creek Member:		
Limestone, pale yellow, soft, impure, highly weathered.....	0.0	1.0
Shale, pale olive.....	1.0	7.0
Shale, medium gray.....	7.0	9.0
Shale, olive.....	9.0	9.9
Americus Member:		
Limestone, medium to dark gray, finely crystalline, contains brachiopods, crinoids.....	9.9	11.1
Admire Group:		
Hamlin Formation:		
Oaks Member:		
Shale, dark gray to black, mottled with olive.....	11.1	12.0
Limestone, yellow, finely crystalline, contains brachiopods, crinoids.....	12.0	12.2
Shale, olive, mottled with yellowish brown and gray.	12.2	13.0
Shale, gray, mottled with olive.....	13.0	14.0
Shale, yellow.....	14.0	17.5
Shale, medium gray.....	17.5	18.0
Shale, yellow, mottled with olive.....	18.0	20.0
Shale, greenish gray.....	20.0	24.0
Shale, yellow.....	24.0	24.5
Shale, red.....	24.5	25.5
Shale, pale olive, mottled with dark reddish brown..	25.5	27.5
Houchens Creek Member:		
Limestone, yellowish brown, finely crystalline to dense.....	27.5	28.0
Shale, greenish gray.....	28.0	28.3
Limestone, yellowish brown, finely crystalline to dense.....	28.3	29.0
Shale, greenish gray, interbedded with limestone, brown.....	29.0	30.0
Stine Member:		
Shale, olive.....	30.0	31.0
Shale, medium gray, mottled with olive.....	31.0	35.0

Shale, light to medium gray.....	35.0	40.0
Shale, medium to dark gray.....	40.0	42.5
Limestone, medium gray, finely crystalline, contains brachiopods.....	42.5	44.0
Shale, medium to dark gray.....	44.0	46.5
Limestone, light greenish gray, finely crystalline..	46.5	48.0
Shale, light greenish gray.....	48.0	49.0
Shale, reddish gray.....	49.0	50.7
Shale, medium gray.....	50.7	51.3
Limestone, light tannish gray, finely crystalline...	51.3	51.9
Shale, light gray.....	51.9	52.5
Shale, olive.....	52.5	53.0
Shale, dark reddish brown.....	53.0	54.0
Shale, reddish yellow.....	54.0	55.5
Shale, medium gray.....	55.5	56.1
Five Point Formation:		
Limestone, light gray, finely crystalline, contains brachiopods, gastropods, algal material.....	56.1	56.9
West Branch Formation:		
Shale, light greenish gray.....	56.9	57.2
Shale, medium gray.....	57.2	62.7
Limestone, light greenish gray, dense, interbedded with shale, greenish gray.....	62.7	65.3
Shale, light greenish gray, mottled with red.....	65.3	68.0
Shale, light greenish gray.....	68.0	68.3
Shale, medium to dark gray.....	68.3	77.5
Falls City Formation:		
Lehmer Member:		
Limestone, dark yellowish orange, soft, porous.....	77.5	78.0
Limestone, light to medium gray, finely crystalline, contains brachiopods.....	78.0	79.5
Shale, medium gray.....	79.5	80.0

Test Hole #157-40
1N 13E 22aabb
Richardson County

Location: NW corner NE NE sec. 22, T. 1 N., R. 13 E., 300 feet west
of Fourmile Creek bridge on south edge of road and 1,320
feet west of northeast corner of section.

Ground elevation: 1,035.0 feet (t) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 8.50 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, sandy, grayish brown.....	0.0	5.0
Sand, clayey, grayish brown.....	5.0	11.0
Sand and gravel, fine, contains limestone chips and pebbles.....	11.0	21.0
Clay, brownish gray.....	21.0	23.0
Permian System - Big Blue Series - Admire Group:		
Shale, bluish gray.....	23.0	23.8
Limestone, hard, bluish gray.....	23.8	24.5
Shale, light gray, with green and tan tint.....	24.5	25.5

Test Hole #155-40
1N 13E 24aabb
Richardson County

Location: Center north line NE sec. 24, T. 1 N., R. 13 E., 200 feet east of Easley Creek bridge and approximately 1,320 feet west of northeast corner of section.

Ground elevation: 1,035.0 feet (t) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 14.50 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, sandy, dark brown.....	0.0	6.0
Clay, sandy, light brown.....	6.0	10.0
Clay, sandy, grayish brown.....	10.0	16.0
Gravel, composed of water-worn limestone and chert..	16.0	20.5

Permian System - Big Blue Series - Council Grove Group:

Clay, shaly, light brown to buff.....	20.5	21.5
Limestone, hard, fossiliferous, brownish gray with red streaks.....	21.5	23.5

Test Hole #156-40
1N 13E 26adda
Richardson County

Location: NE SE SE NE sec. 26, T. 1 N., R. 13 E., on north edge of road approximately 100 feet west of Easley Creek bridge, and approximately 660 feet west of the east section line.

Ground elevation: 1,105.0 feet (t) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 13.30 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, sandy, brown.....	0.0	5.0
Clay, sandy, brown, contains limestone chips.....	5.0	16.0
Gravel, contains pebbles and large limestone chips..	16.0	21.0
Clay, brown, contains some limestone chips.....	21.0	24.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone.....	24.0	25.0
Shale, buff to gray.....	25.0	27.5
Limestone.....	27.5	28.0
Shale, carbonaceous, black.....	28.0	29.0
Shale, buff to gray.....	29.0	30.0
Limestone, hard, gray.....	30.0	30.5
Shale, black, buff gray below 36.5 ft.....	30.5	37.0
Limestone, hard.....	37.0	

Test Hole #158-40
1N 13E 27bcd
Richardson County

Location: SW SE SW NW sec. 27, T. 1 N., R. 13 E., 150 feet east of
 Fourmile Creek bridge on south edge of road.
 Ground elevation: 1,060.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
 Depth to water: 8.22 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, sandy, brown.....	0.0	8.0
Gravel, contains limestone pebbles.....	8.0	12.0
Clay, sandy, brownish gray, contains limestone chips	12.0	17.0
Gravel, contains limestone chips and pebbles.....	17.0	20.5

Permian System - Big Blue Series - Admire Group:

Shale, green.....	20.5	21.0
Limestone, hard, light gray.....	21.0	21.5
Shale, light bluish gray.....	21.5	22.0
Limestone, contains 2-inch layer of shale at 22.4 ft	22.0	22.5
Limestone, hard, gray.....	22.5	23.0
Shale, gray, contains mica.....	23.0	27.0
Shale, dark gray.....	27.0	35.0
Shale, black.....	35.0	37.0
Limestone, dark gray.....	37.0	37.5

Test Hole #4-78
1N 13E 28daab
Richardson County

Location: NW NE NE SE sec. 28, T. 1 N., R. 13 E., 2,655 feet south of north section line, and 612 feet west of east section line.

Ground elevation: 1,068 ft (Humboldt SW 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Clay, sandy, brownish gray.....	5.0	11.5
Permian System - Big Blue Series - Admire Group:		
Hamlin Formation:		
Oaks Member:		
Shale, greenish gray.....	11.5	15.0
Shale, pale yellowish brown, mottled with olive, red	15.0	16.0
Shale, greenish gray.....	16.0	17.0
Houchens Creek Member:		
Shale, light bluish gray, interbedded with limestone, light gray, dense.....	17.0	21.0
Stine Member:		
Shale, greenish gray.....	21.0	29.0
Shale, medium gray.....	29.0	35.0
Limestone, medium to dark gray, medium to finely crystalline, contains brachiopods, interbedded with shale, dark gray.....	35.0	36.0
Shale, medium gray.....	36.0	36.7
Shale, greenish gray, interbedded with limestone, brownish gray, dense, thin.....	36.7	40.0
Shale, reddish brown.....	40.0	42.0
Shale, light greenish gray.....	42.0	42.5
Limestone, tannish gray, finely crystalline.....	42.5	43.5
Shale, light greenish gray.....	43.5	45.5
Shale, reddish gray.....	45.5	46.3
Shale, light greenish gray.....	46.3	46.6
Shale, olive.....	46.6	46.8
Five Point Formation:		
Limestone, light gray, irregularly crystalline, contains algal material.....	46.8	49.0
West Branch Formation:		
Shale, olive.....	49.0	50.5
Shale, light gray.....	50.5	56.5
Shale, greenish gray, interbedded with limestone, tannish gray, dense.....	56.5	60.0
Limestone, light gray, dense, soft.....	60.0	61.0

Shale, light greenish gray.....	61.0	63.3
Limestone, dark gray, impure.....	63.3	65.0
Shale, dark gray.....	65.0	73.5
Falls City Formation:		
Lehmer Member:		
Limestone, light gray, irregularly crystalline, interbedded with shale, gray.....	73.5	76.5
Reserve Member:		
Shale, medium gray.....	76.5	78.2
Miles Member:		
Limestone, light gray, salt and pepper appearance...	78.2	78.8
Onaga Formation:		
Shale, light greenish gray.....	78.8	79.5
Shale, reddish gray, mottled with light greenish gray.....	79.5	87.2
Shale, greenish gray.....	87.2	93.2
Shale, red.....	93.2	98.0
Shale, olive gray.....	98.0	99.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light gray, mottled with olive, very finely crystalline.....	99.5	101.7
Pony Creek - Plumb Members:		
Shale, olive.....	101.7	104.3
Shale, greenish gray.....	104.3	108.0
Shale, red.....	108.0	112.5
Shale, red, interbedded with shale, greenish gray...	112.5	117.0
Shale, olive.....	117.0	118.0
Shale, gray.....	118.0	119.2
Nebraska City Member:		
Limestone, medium gray, finely crystalline, impure, contains brachiopods, crinoids.....	119.2	120.0
Root Formation:		
French Creek Member:		
Shale, gray.....	120.0	120.9
Coal, black.....	120.9	121.2
Shale, medium gray.....	121.2	126.0

Test Hole #5-78
1N 13E 28bddd
Richardson County

Location: SE corner NW sec. 28, T. 1 N., R. 13 E., 2,630 feet south of north section line, and 2,632 feet east of west section line.

Ground elevation: 1,132 ft (Humboldt SW 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, olive, mottled with red.....	2.0	4.0
Shale, olive, mottled with gray, yellow.....	4.0	10.0
Shale, brownish olive, mottled with gray, yellow....	10.0	25.0
Shale, light gray, mottled with yellow.....	25.0	32.8
Emporia Formation:		
Elmont Member:		
Limestone, medium gray, finely crystalline, contains brachiopods and crinoids.....	32.8	35.5
Shale, medium gray, limy.....	35.5	36.8
Limestone, medium gray, finely crystalline, contains brachiopods and fusulinids.....	36.8	37.0
Harveyville Member:		
Shale, light gray.....	37.0	39.5
Shale, medium gray.....	39.5	43.7
Reading Member:		
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	43.7	45.9
Shale, medium gray.....	45.9	46.1
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	46.1	46.5
Shale, medium gray.....	46.5	47.2
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	47.2	48.8
Auburn Formation:		
Shale, medium gray.....	48.8	54.5
Limestone, light gray, finely crystalline, inter-bedded with shale, greenish gray.....	54.5	56.3
Shale, light greenish gray.....	56.3	56.5
Shale, light to medium gray.....	56.5	60.0
Shale, medium gray.....	60.0	62.0

Test Hole #8-78
1N 13E 28baaa
Richardson County

Location: NE corner NW sec. 28, T. 1 N., R. 13 E., 20 feet south of
north section line, and 2,625 feet east of west section line.
Ground elevation: 1,127. ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Clay, brownish gray.....	1.0	6.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Stotler Formation:		
Dry Member:		
Shale, reddish brown.....	6.0	13.0
Limestone, cream and dark yellow, finely crystalline, contains crinoids, pyrite, interbedded with shale, reddish brown.....	13.0	17.0
Shale, pale olive gray.....	17.0	18.0
Shale, red, mottled with olive.....	18.0	28.7
Shale, olive brown.....	28.7	31.3
Shale, medium gray.....	31.3	52.6
Dover Member:		
Limestone, bluish gray, finely crystalline, contains brachiopods, crinoids.....	52.6	53.7
Shale, light gray.....	53.7	54.7
Limestone, light tannish gray, light greenish gray, finely crystalline.....	54.7	54.9
Zeandale - Pillsbury Formations:		
Shale, light greenish gray to light gray.....	54.9	57.0
Shale, reddish brown.....	57.0	59.7
Shale, pale olive, mottled with light gray.....	59.7	62.0
Shale, medium gray.....	62.0	72.0
Shale, light to medium gray.....	72.0	80.5
Tarkio Member:		
Limestone, medium gray, contains brachiopods.....	80.5	81.9
Shale, light greenish gray, interbedded with shale, dark gray, with black carbonaceous streaks.....	81.9	82.4
Limestone, brownish gray, finely crystalline, contains brachiopods, crinoids.....	82.4	82.9
Shale, light greenish gray.....	82.9	84.0
Shale, reddish brown.....	84.0	85.4

Limestone, cream to white, finely crystalline, contains glauconite, fusulinids, <u>Osaqia</u>	85.4	90.0
Willard Formation:		
Siltstone, light greenish gray, contains very fine mica.....	90.0	94.0
Shale, light and dark olive, mottled with yellow, gray.....	94.0	98.0
Shale, light to medium gray.....	98.0	117.5
Shale, light to medium gray, interbedded with limestone, brown, dense, thin.....	117.5	117.6
Shale, medium gray.....	117.6	122.5
Emporia Formation:		
Elmont Member:		
Limestone, brownish gray, very finely crystalline, contains brachiopods.....	122.5	123.9
Shale, medium gray.....	123.9	124.2
Limestone, light gray, very finely crystalline, contains brachiopods.....	124.2	126.5
Shale, greenish gray.....	126.5	127.0
Limestone, light brownish gray, irregularly crystalline, contains pyrite.....	127.0	127.5
Harveyville Member:		
Shale, light to medium gray, mottled with olive.....	127.5	130.0

Test Hole #11-78
1N 13E 31dcdd
Richardson County

Location: SE SE SW SE sec. 31, T. 1 N., R. 13 E., 23 feet north of
 south section line, and 1,480 feet west of east section line.
 Ground elevation: 1,229.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	1.0
Clay, silty, sandy, gravelly, brownish orange.....	1.0	7.0
Clay, silty, brownish orange, contains limy nodules.....	7.0	13.0
Clay, yellowish brown, silty, sandy, gravelly.....	13.0	23.0
Clay, silty, olive yellow.....	23.0	26.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Burlingame Formation:

South Fork Member:

Limestone, yellowish brown, very finely crystalline, highly weathered, contains brachiopods, pelecypods	26.5	29.5
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Winnebago Member:

Shale, olive gray.....	29.5	32.5
Limestone, yellow, finely crystalline.....	32.5	33.0
Shale, olive gray.....	33.0	34.3
Shale, dark gray.....	34.3	35.0

Taylor Branch Member:

Limestone, medium gray, finely crystalline.....	35.0	35.5
Shale, dark gray to black.....	35.5	35.7
Limestone, light to medium bluish gray, very finely crystalline, contains pyrite, brachiopods.....	35.7	37.8
Shale, greenish gray.....	37.8	38.1
Limestone, light gray, very finely crystalline.....	38.1	38.9

Scranton Formation:

Silver Lake Member:

Sandstone, light brown, silty.....	38.9	41.1
Shale, medium gray, sandy.....	41.1	46.0
Shale, light to medium gray.....	46.0	53.0
Shale, medium gray.....	53.0	55.2

Rulo Member:

Limestone, light brownish gray, very finely crystalline, contains brachiopods, crinoids, fusulinids.....	55.2	55.9
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Cedarvale Member:

Shale, medium gray.....	55.9	67.5
Shale, greenish gray.....	67.5	70.0

White Cloud Member:

Shale, very light greenish gray.....	70.0	75.0
Shale, light to medium gray.....	75.0	83.0
Shale, light gray.....	83.0	88.2
Sandstone, medium gray, silty.....	88.2	88.3
Shale, medium gray, silty, sandy.....	88.3	92.0
Shale, medium gray, silty.....	92.0	107.0

Test Hole #10-78
1N 13E 32bbbb
Richardson County

Location: NW corner sec. 32, T. 1 N., R. 13 E., 12 feet south of
north section line, and 10 feet east of west section line.
Ground elevation: 1,205.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	3.0
Clay, brownish gray, yellow, sandy, gravelly.....	3.0	10.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Zeandale Formation:

Wamego Member:

Shale, brownish gray.....	10.0	11.0
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Tarkio Member:

Limestone, yellowish brown, finely crystalline, contains fusulinids, and <u>Osagia</u>	11.0	15.0
Limestone, yellowish brown, finely crystalline, interbedded with shale, olive.....	15.0	16.0

Willard Formation:

Shale, olive.....	16.0	21.0
Shale, olive, interbedded with gray.....	21.0	22.0
Shale, medium gray.....	22.0	48.8
Shale, black, contains black, carbonaceous material.	48.8	49.0

Emporia Formation:

Elmont Member:

Limestone, medium gray, finely crystalline, contains brachiopods, fusulinids.....	49.0	51.0
Shale, greenish gray.....	51.0	52.9
Limestone, light tannish gray, finely crystalline, contains brachiopods, fusulinids.....	52.9	53.4

Harveyville Member:

Shale, medium gray.....	53.4	56.0
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Test Hole #2-78
1N 13E 33ddddd
Richardson County

Location: SE corner sec. 33, T. 1 N., R. 13 E., 35 feet north of
 south section line, and 45 feet west of east section line.
 Ground elevation: 1,183.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	4.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Wamego Member:		
Shale, brownish gray, silty.....	4.0	10.0
Shale, dark brown, silty.....	10.0	16.0
Shale, light gray.....	16.0	17.5
Tarkio Member:		
Limestone, brown, coarse to irregularly crystalline, contains fusulinids and brachiopods.....	17.5	18.0
Shale, light greenish gray.....	18.0	19.5
Limestone, brown, finely crystalline, contains brachiopods, fusulinids, <u>Osagia</u>	19.5	20.0
Shale, orangish brown.....	20.0	21.0
Limestone, yellowish brown, finely crystalline, contains brachiopods, fusulinids, <u>Osagia</u>	21.0	23.5
Willard Formation:		
Shale, light bluish gray.....	23.5	29.5
Shale, light to medium gray.....	29.5	45.0
Shale, medium gray.....	45.0	56.0
Shale, dark gray.....	56.0	57.0
Emporia Formation:		
Elmont Member:		
Limestone, tannish gray, finely crystalline to dense, contains fusulinids, brachiopods.....	57.0	59.5
Shale, light to medium gray.....	59.5	60.5
Limestone, light tannish gray, finely crystalline to dense.....	60.5	62.2
Harveyville Member:		
Shale, light to medium gray.....	62.2	66.5
Reading Member:		
Limestone, medium gray, finely crystalline, contains brachiopods, fusulinids.....	66.5	69.5
Shale, medium gray.....	69.5	70.0
Limestone, light gray, finely crystalline to dense, impure, contains brachiopods.....	70.0	70.5

Shale, medium gray.....	70.5	71.5
Limestone, light gray, finely crystalline, impure, contains brachiopods, crinoids.....	71.5	72.0
Auburn Formation:		
Shale, light gray.....	72.0	77.0

Test Hole #1-78
1N 13E 34cdcc
Richardson County

Location: SW SW SE SW sec. 34, T. 1 N., R. 13 E., 15 feet north of south section line, and 1,495 feet east of west section line.

Ground elevation: 1,215.0 ft (Humboldt SW 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	3.0
Permian System - Big Blue Series - Council Grove Group:		
Grenola Formation:		
Legion Member:		
Shale, yellowish olive.....	3.0	5.0
Sallyards Member:		
Limestone, medium gray, finely crystalline.....	5.0	6.5
Roca Formation:		
Shale, yellowish brown.....	6.5	9.0
Shale, medium to dark gray.....	9.0	11.5
Limestone, light brown, finely crystalline to dense, soft.....	11.5	11.8
Shale, light to medium gray.....	11.8	15.0
Shale, light greenish gray, contains gypsum crystals.....	15.0	18.5
Limestone, very light gray to buff, dense, impure...	18.5	21.5
Shale, medium gray.....	21.5	22.0
Limestone, very light gray to buff, dense, impure...	22.0	24.0
Shale, light greenish gray.....	24.0	24.5
Limestone, buff to light brown, dense.....	24.5	26.5
Shale, light greenish gray.....	26.5	27.0
Limestone, light brown, dense.....	27.0	29.0
Shale, pale olive, mottled with red.....	29.0	35.5
Red Eagle Formation:		
Howe Member:		
Limestone, light gray to brown, irregularly crystalline, impure.....	35.5	39.5
Bennett Member:		
Shale, black, carbonaceous.....	39.5	44.0
Glenrock Member:		
Limestone, light brown, finely crystalline, contains brachiopods, fusulinids.....	44.0	45.0
Shale, (lost circulation, no sample).....	45.0	50.0

Test Hole #3-78
1N 13E 34ccdc
Richardson County

Location: SW SE SW SW sec. 34, T. 1 N., R. 13 E., 15 feet north of
 south section line, and 825 feet east of west section line.
 Ground elevation: 1,187.0 ft (Humboldt SW 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Clay, light brown.....	2.0	4.0
Clay, reddish brown.....	4.0	7.0
Permian System - Big Blue Series - Admire Group:		
Onaga Formation:		
Towle Member:		
Shale, greenish gray, contains manganese staining...	7.0	10.0
Shale, olive, mottled with red.....	10.0	11.0
Shale, dark reddish brown.....	11.0	15.5
Shale, reddish brown, mottled with olive, green.....	15.5	16.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light gray, irregularly crystalline, impure, contains brachiopods, algal material.....	16.0	18.5
Pony Creek - Plumb Members:		
Shale, pale olive.....	18.5	21.0
Shale, reddish gray, mottled with green.....	21.0	23.5
Shale, greenish gray, mottled with orange.....	23.5	25.0
Shale, reddish gray.....	25.0	28.5
Shale, light greenish gray.....	28.5	29.5
Shale, red.....	29.5	35.0
Shale, red, interbedded with pale yellow, olive.....	35.0	36.0
Limestone, yellowish brown, finely crystalline, impure, contains brachiopods, algal material.....	36.0	37.0
Shale, light greenish gray, silty.....	37.0	41.0
Shale, medium gray.....	41.0	43.3
Nebraska City Member:		
Limestone, dark gray, finely crystalline, contains brachiopods, crinoids.....	43.3	43.9
Root Formation:		
French Creek Member:		
Coal, black, soft.....	43.9	44.1
Shale, light bluish gray.....	44.1	50.0
Shale, medium to dark gray.....	50.0	59.5

Jim Creek Member:

Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	50.5	60.5
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Friedrich Member:

Shale, light to medium gray.....	60.5	64.5
Shale, reddish brown.....	64.5	67.0
Shale, light greenish gray, interbedded with sandstone, light greenish gray, contains mica.....	67.0	68.5
Sandstone, light tannish gray, contains mica, interbedded with shale, greenish gray.....	68.5	70.5
Sandstone, light tannish gray, contains mica, interbedded with shale, red.....	70.5	73.5
Shale, reddish brown.....	73.5	77.0

Test Hole #77-40
1N 14E 12ccbb
Richardson County

Location: NW NW SW SW sec.12, T. 1 N., R. 14 E., 1,056 feet north of
southwest corner of section on east edge of road.
Ground elevation: 937.2 feet (a) (Humboldt SE 7.5 min. quadrangle)
Depth to water: 4.60 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark gray to black.....	0.0	10.0
Clay, silty, gray, with greenish gray streaks.....	10.0	17.0
Clay, silty, gray.....	17.0	22.0
Clay, silty, gray, with limonitic streaks and concretions.....	22.0	29.0
Clay, silty to sandy, greenish gray.....	29.0	35.0
Clay, silty to sandy, bluish gray.....	35.0	40.5
Permian System - Big Blue Series - Admire Group:		
Limestone, bluish gray.....	40.5	42.0
Shale, light gray, calcareous, hard.....	42.0	45.0
Shale, light gray, calcareous.....	45.0	47.0

Test Hole #80-40
1N 14E 1dddd
Richardson County

Location: SE corner, sec. 1, T. 1 N., R. 14 E., 75 feet west of
 southeast corner of section on north edge of road.

Ground elevation: 929.2 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 12.50 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey.....	0.0	2.0
Clay, dark gray to black.....	2.0	9.0
Clay, gray to brownish gray, with limonitic stains.	9.0	21.0
Clay, silty, greenish gray.....	21.0	34.0
Sand, silty.....	34.0	37.0
Sand and gravel, fine to medium, yellow.....	37.0	42.0
Gravel, yellowish brown, coarse.....	42.0	44.5
Permian System - Big Blue Series - Admire Group:		
Limestone, brown to gray.....	44.5	46.0
Shale, black.....	46.0	47.0
Limestone, hard, dark gray.....	47.0	

Test Hole #89-40
1N 14E 4aadd
Richardson County

Location: SE SE NE NE sec. 4, T. 1 N., R. 14 E, 1,056 feet south of
 northeast corner of section.

Ground elevation: 944.5 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 19.60 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, dark brown to black.....	0.0	4.0
Clay, sandy, brown.....	4.0	24.0
Silt, sandy, dark gray.....	24.0	29.0
Silt, sandy to gravelly, dark gray.....	29.0	31.0
Gravel, gray, fine to medium, contains limestone fragments below 37.0 ft.....	31.0	39.0

Permian System - Big Blue Series - Admire Group:

Limestone, light gray.....	39.0	40.5
Shale, gray.....	40.5	48.5

Test Hole #90-40
1N 14E 4daaa
Richardson County

Location: NE NE NE SE sec. 4, T. 1 N., R. 14 E., 180 feet south of
the northeast corner of the southeast quarter of section.
Ground elevation: 936.3 feet (a) (Humboldt SE 7.5 min. quadrangle)
Depth to water: 17.30 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray to black.....	0.0	7.0
Clay, brownish gray.....	7.0	17.0
Clay, silty, gray, limonitic staining.....	17.0	23.0
Clay, sandy to gravelly, gray.....	23.0	26.0
Sand and gravel, white to pink, fine to coarse.....	26.0	30.0
Gravel, light colored, coarse texture, contains limonitic fragments.....	30.0	38.5
Permian System - Big Blue Series - Admire Group:		
Limestone fragments.....	38.5	41.0
Shale, red, contains mica.....	41.0	45.0

Test Hole #91-40
1N 14E 4ddaa
Richardson County

Location: NE NE SE SE sec. 4, T. 1 N., R. 14 E., 125 feet south of
 bridge across South Fork Nemaha River along west edge of road, and
 1,108 feet north of southeast corner of section.
 Ground elevation: 940.4 feet (a) (Humboldt SE 7.5 min. quadrangle)
 Depth to water: 10.80 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, black.....	0.0	6.0
Clay, brownish gray.....	6.0	20.0
Clay, greenish gray.....	20.0	36.0
Silt, sandy, greenish gray to gray.....	36.0	45.0
Gravel, light gray, medium to coarse.....	45.0	48.0

Permian System - Big Blue Series - Admire Group:

Limestone, hard, contains much marcasite.....	48.0	48.7
Shale, gray, arenaceous.....	48.7	52.0
Shale, very hard, gray.....	52.0	53.5
Shale, gray.....	53.5	55.0

Test Hole #94-40
1N 14E 5bcbc
Richardson County

Location: SW NW SW NW sec. 5, T. 1 N., R. 14 E., 792 feet north of south corner of the northwest quarter of section on east edge of road.

Ground elevation: 955.8 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 22.50 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, black to gray.....	0.0	8.0
Clay, silty, gray to buff, limonitic streaks.....	8.0	19.0
Clay, brownish gray to dark gray.....	19.0	23.0
Clay, greenish gray.....	23.0	27.0
Clay, sandy.....	27.0	28.0
Gravel, fine to coarse, yellowish brown and gray, contains limestone fragments below 47.5 ft.....	28.0	51.0
Permian System - Big Blue Series - Admire Group:		
Shale, greenish gray.....	51.0	53.0
Shale, red.....	53.0	59.0

Test Hole #93-40
1N 14E 6dddd
Richardson County

Location: SE SE SE SE sec. 6, T. 1 N., R. 14 E., approximately 120 feet west of southeast corner of section.

Ground elevation: 961.1 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 14.10 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brownish gray to gray.....	0.0	8.0
Clay, silty, gray to buff.....	8.0	27.0
CLay, silty to sandy.....	27.0	37.0
Sand, silty, gravelly.....	37.0	44.0
Gravel, yellowish brown, medium coarse, contains green shale below 49.0 ft.....	44.0	51.0
Permian System - Big Blue Series - Admire Group:		
Shale, green, bluish gray, red.....	51.0	53.0
Limestone, brown.....	53.0	

Test Hole #95-40
1N 14E 6cddc
Richardson County

Location: SW SE SE SW sec. 6, T. 1 N., R. 14 E., 2,112 feet east of southwest corner of section on north edge of road.
 Ground elevation: 968.9 feet (a) (Humboldt SW 7.5 min. quadrangle)
 Depth to water: 16.5 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brownish gray to black.....	0.0	6.0
Clay, brownish gray.....	6.0	12.0
Clay, silty, buff to gray.....	12.0	21.0
Clay, silty, greenish gray to dark gray.....	21.0	31.0
Silt, greenish gray.....	31.0	44.0
Silt, dark gray, sandy, gravelly.....	44.0	46.0
Gravel, contains limestone fragments.....	46.0	47.5
Permian System - Big Blue Series - Admire Group:		
Shale, bluish gray.....	47.5	50.5
Limestone, dark bluish gray.....	50.5	51.0

Test Hole #92-40
1N 14E 9aadd
Richardson County

Location: SE SE NE NE sec. 9, T. 1 N., 14 E., approximately 1,056 feet south of northeast corner of section.
 Ground elevation: 938.4 feet (a) (Humboldt SE 7.5 min. quadrangle)
 Depth to water: 8.10 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	9.0
Clay, gray.....	9.0	19.0
Clay, greenish gray.....	19.0	26.0
Clay, silty, black.....	26.0	34.0
Sand, silty, black.....	34.0	38.5
Gravel, yellowish brown, fine to coarse.....	38.5	49.0
Permian System - Big Blue Series - Admire Group:		
Shale, light gray.....	49.0	53.0
Shale, light gray, contains a 4" hard sandy limestone layer.....	53.0	55.0

Test Hole #79-40
1N 14E 11aaaa
Richardson County

Location: NE corner sec. 11, T. 1 N., R. 14 E., 60 feet west of
 northeast corner.

Ground elevation: 936.6 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 19.90 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, black.....	0.0	4.0
Clay, gray.....	4.0	9.0
Clay, brownish gray.....	9.0	22.0
Clay, bluish gray.....	22.0	29.0
Clay, silty, greenish gray.....	29.0	35.0
Sand and gravel, fine.....	35.0	39.0
Gravel, coarse, gray, red, yellow, contains limestone fragments below 43.5 ft.....	39.0	47.0
Permian System - Big Blue Series - Admire Group:		
Shale, bluish gray.....	47.0	55.0

Test Hole #86-40
1N 14E 11bbbb
Richardson County

Location: NW NW NW NW sec. 11, T. 1 N., R. 14 E., approximately 270 feet east of northwest corner of section.

Ground elevation: 939.2 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 19.70 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	5.0
Clay, gray.....	5.0	14.0
Clay, silty, brownish gray.....	14.0	20.0
Clay, gray, with limonitic streaks.....	20.0	23.0
Clay, very sandy, greenish gray.....	23.0	32.0
Gravel, red, fine to very coarse, contains large limestone fragments below 34.0 ft.....	32.0	39.0
Permian System - Big Blue Series - Admire Group:		
Shale, black.....	39.0	40.5
Limestone, bluish gray.....	40.5	

Test Hole #78-40
1N 14E 12bccb
Richardson County

Location: NW SW SW NW sec. 12, T. 1 N., R. 14 E., approximately 2200 feet south of northwest corner of section on east edge of road.
 Ground elevation: 929.5 feet (a) (Humboldt SE 7.5 min. quadrangle)
 Depth to water: 22.60 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark gray to black.....	0.0	9.0
Clay, buff gray.....	9.0	13.0
Clay, dark gray.....	13.0	17.0
Clay, silty, dark gray.....	17.0	25.0
Silt, sandy, gray.....	25.0	27.0
Gravel, fine to medium, contains some large limestone chips below 29.0 ft.....	27.0	37.0
Permian System - Big Blue Series - Admire Group:		
Shale, bluish gray.....	37.0	45.0

Test Hole #124-40
1N 14E 14dadd
Richardson County

Location: SE SE NE SE sec. 14, T. 1 N., R. 14 E., 300 feet west of
 highway 75 and 1,584 feet north of the southeast corner
 of section.

Ground elevation: 968.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 6.0 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Clay, dark gray.....	0.0	11.0
Clay, silty, buff, pebbly, gravelly.....	11.0	13.0
Clay, buff to reddish buff.....	13.0	21.0
Gravel, contains limestone pebbles, water worn shale	21.0	24.0

Permian System - Big Blue Series - Admire Group:

Shale, olive green.....	24.0	26.0
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Test Hole #125-40
1N 14E 14dadd
Richardson County

Location: SE SE NE SE sec. 14, T. 1 N., R. 14 E., 50 feet south of
 test hole 124-40, 1,584 feet north of the southeast corner of the
 section.

Ground elevation: 970.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, very dark brown.....	0.0	4.0
Clay, gray, limonitic stain below 7.0 ft.....	4.0	11.0
Clay, buff, slightly gravelly and pebbly.....	11.0	12.0
Clay, silty, buff to reddish reddish buff.....	12.0	20.0
Clay, gravelly, contains limestone fragments.....	20.0	23.0
Gravel, contains large limestone fragments.....	23.0	24.0
Permian System - Big Blue Series - Admire Group:		
Shale, olive green.....	24.0	26.5
Shale, gray.....	26.5	29.0

Test Hole #126-40
1N 14E 14dadd
Richardson County

Location: SE SE NE SE sec. 14, T. 1 N., R. 14 E., 125 feet northeast of test hole 125-40, 300 feet west of highway 75, and 1,584 feet north of southeast corner of section.

Ground elevation: 970.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	4.0
Clay, gray to brownish gray.....	4.0	15.0
Clay, hard, gray.....	15.0	30.0
Clay, buff to reddish buff, trace of gravel.....	30.0	34.0
Gravel, contains limestone fragments.....	34.0	35.0
Permian System - Big Blue Series - Admire Group:		
Shale, dark bluish gray.....	35.0	38.0

Test Hole #127-40
1N 14E 14daad
Richardson County

Location: SE NE NE SE sec. 14, T. 1 N., R. 14 E., 25 feet northeast
of test hole 126-40, 300 feet west of highway 75, 2,112 feet north
of southeast corner of section.

Ground elevation: 965.5 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 6.0 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, dark brown to black.....	0.0	4.0
Clay, gray, with some brown streaks.....	4.0	28.0
Clay, gray.....	28.0	30.5
Gravel, contains water worn limestone, shale.....	30.5	33.5

Permian System - Big Blue Series - Admire Group:

Shale, dark bluish gray.....	33.5	34.8
Limestone, brownish gray.....	34.8	35.0

Test Hole #128-40**1N 14E 14daaa****Richardson County**

Location: NE NE NE SE sec. 14, T. 1 N., R. 14 E., 50 feet northeast
of test hole 127-40, 300 feet west of highway 75, 2,376 feet north
of southeast corner of section.

Ground elevation: 965.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 6.0 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, brownish black.....	0.0	4.0
Clay, gray, brownish gray.....	4.0	28.0
Clay, gray.....	28.0	30.0
Gravel, contains weather worn limestone, shale, some sharp limestone fragments.....	30.0	33.0

Permian System - Big Blue Series - Admire Group:

Shale, bluish gray.....	33.0	34.0
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Test Hole #139-40
1N 14E 14ddddd
Richardson County

Location: SE corner sec. 14, T. 1 N., R. 14 E., 100 feet west and 45 feet north of southeast corner of section.

Ground elevation: 1,005.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark to reddish brown.....	0.0	5.0
Clay, grayish brown, with rust-colored streaks.....	5.0	20.0
Clay, buff to reddish buff.....	20.0	25.0
Permian System - Big Blue Series - Admire Group:		
Limestone, gray.....	25.0	26.0
Shale, slightly sandy, brown to gray.....	26.0	27.0
Shale, gray, contains thin limestone layer.....	27.0	32.0
Limestone, brown.....	32.0	33.0
Shale, gray to bluish gray, with some red and green streaks.....	33.0	37.0
Shale, black.....	37.0	39.5
Limestone, hard.....	39.5	

Test Hole #154-40
1N 14E 20baaa
Richardson County

Location: NE corner NW sec. 20, T. 1 N., R. 14 E., 65 feet south of
 northeast corner of northwest quarter of section on west edge of
 road.

Ground elevation: 1,005.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 12.88 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, sandy, dark brown.....	0.0	5.0
Clay, sandy, brown, contains limestone pebbles below 9.0 ft.....	5.0	14.0
Gravel, shaly, contains limestone pebbles and fragments.....	14.0	19.5
Permian System - Big Blue Series - Admire Group:		
Limestone, brown.....	19.5	20.2
Shale, light gray, calcareous.....	20.2	22.5
Limestone, bluish gray.....	22.5	23.5
Shale.....	23.5	24.0
Limestone, dark gray.....	24.0	24.5
Shale, bluish gray, contains mica.....	24.5	28.5
Limestone, brown.....	28.5	29.0

Test Hole #153-40
1N 14E 26dbdb
Richardson County

Location: NW corner SE NW SE sec. 26, T. 1 N., R. 14 E.
 Ground elevation: 1,030.0 feet (t) (Humboldt SE 7.5 min. quadrangle)
 Depth to water: 9.30 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, sandy, brown.....	0.0	13.0
Clay, silty, gray.....	13.0	17.5
Clay, sandy, greenish gray.....	17.5	19.5
Sand and gravel, mostly limestone.....	19.5	21.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, dark bluish gray to black.....	21.0	25.0
Limestone, dark to light gray, contains some shale..	25.0	26.5
Shale, dark bluish gray.....	26.5	29.0

Test Hole #7-U-40
1N 15E 1bbbb
Richardson County

Location: NW NW NW NW sec. 1, T. 1 N., R. 15 E., 225 feet east and
 120 feet south of northwest corner of section.

Ground elevation: 1,1017 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	5.0
Clay, buff.....	5.0	15.0
Clay, tan.....	15.0	18.0
Sand, gravelly, light brown.....	18.0	44.0
Permian System - Big Blue Series - Admire Group:		
Shale, light bluish gray.....	44.0	46.5
Limestone.....	48.2	49.8

Test Hole #57-40
1N 15E 2bbbb
Richardson County

Location: NW NW NW NW sec. 2, T. 1 N., R. 15 E., 300 feet south of
 northwest corner on east edge of road.
 Ground elevation: 910 feet (t) (Salem 7.5 min. quadrangle)
 Depth to water: 4.90 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	4.0
Clay, dark gray to black.....	4.0	9.0
Clay, dark brownish gray.....	9.0	13.0
Clay, silty, sandy, gray, with limonitic streaks....	13.0	19.0
Clay, silty, bluish gray.....	19.0	27.0
Gravel, fine to coarse, gray to white.....	27.0	38.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, greenish gray.....	38.5	40.0
Shale, dark bluish gray.....	40.0	43.0
Shale, light bluish gray.....	43.0	44.0
Limestone, bluish gray.....	44.0	45.0
Shale, dark gray.....	45.0	46.0
Shale, calcareous, dark red.....	46.0	49.0

Test Hole #58-40
1N 15E 3adaa
Richardson County

Location: NE NE SE NE sec. 3, T. 1 N., R. 15 E., 1,478 feet south of
 northeast corner of section on west edge of road.

Ground elevation: 910.0 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 4.00 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey.....	0.0	3.0
Clay, black.....	3.0	8.0
Clay, silty, gray to light gray.....	8.0	11.0
Clay, silty, sandy, gray, limonitic staining.....	11.0	20.0
Sand, silty, gray.....	20.0	26.0
Gravel, medium to coarse, greenish gray.....	26.0	36.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, rust-colored to greenish gray.....	36.0	37.5
Shale, calcareous, gray.....	37.5	38.0
Shale, gray to dark red.....	38.0	39.0

Test Hole #59-40
1N 15E 13daaa
Richardson County

Location: NE NE NE SE sec. 3, T. 1 N., R. 15 E., on west edge of road, 210 feet north of Chicago, Burlington, Quincy Railroad, 2,798 feet south of northeast corner of section.

Ground elevation: 910 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray to black.....	0.0	5.0
Clay, brownish gray, with limonitic streaks.....	5.0	20.0
Clay, dark gray to black.....	20.0	24.0
Silt, sandy, dark greenish gray.....	24.0	37.0
Sand and gravel, fine to coarse.....	37.0	40.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Gravel, coarse, contains large limestone and sandstone fragments.....	40.0	43.5
Shale, gray, contains calcareous streaks.....	43.5	46.0

Test Hole #60-40
1N 15E 3ddaa
Richardson County

Location: NE NE SE SE sec. 3, T. 1 N., R. 15 E., 1,320 feet north of
 southeast corner of section.

Ground elevation: 909.4 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 20.50 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, clayey, sandy, dark brown.....	0.0	20.0
Sand, silty, brown to bluish gray.....	20.0	40.0
Gravel, coarse, contains limestone and sandstone pebbles.....	40.0	45.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, hard.....	45.0	46.0
Shale, gray to dark red.....	46.0	47.0

Test Hole #69-40
1N 15E 3baaa
Richardson County

Location: NE corner NW sec. 3, T. 1 N., R. 15 E., 90 feet south of
 Chicago, Burlington, Quincy Railroad on west edge of road.
 Ground elevation: 915 feet (t) (Salem 7.5 min. quadrangle)
 Depth to water: 21.20 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, clayey, brown, gray.....	0.0	29.0
Silt, clayey, bluish gray.....	29.0	35.0
Sand, silty, bluish gray.....	35.0	40.0
Sand and gravel, fine to coarse, gray.....	40.0	43.0
Gravel, coarse, gray, yellow, contains large limestone fragments below 45.0 ft.....	43.0	47.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, calcareous, bluish gray.....	47.0	51.0

Test Hole #76-40
1N 15E 7dadd
Richardson County

Location: SE corner NE SE sec. 7, T. 1 N., R. 15 E., 1,320 feet north
of southeast corner of section and 50 feet west on north
edge of road.

Ground elevation: 922.2 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 25.70 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, dark gray to black.....	0.0	10.0
Clay, gray to brown.....	10.0	15.0
Clay, silty, buff to gray, iron staining.....	15.0	23.0
Clay, silty, sandy, greenish gray.....	23.0	31.0
Sand and gravel, fine, green.....	31.0	33.0
Gravel, fine to coarse, yellowish brown, contains limestone fragments below 40.0 ft.....	33.0	44.0

Permian System - Big Blue Series - Admire Group:

Shale, dark red to black.....	44.0	49.0
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Test Hole #81-40
1N 15E 7aaaa
Richardson County

Location: NE corner sec. 7, T. 1 N., R. 15 E., on south edge of road,
 50 feet west of northeast corner of section.
 Ground elevation: 920.0 feet (t) (Humboldt SE 7.5 min. quadrangle)
 Depth to water: 19.20 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brownish gray.....	0.0	7.0
Clay, silty, gray to buff, with limonitic staining..	7.0	19.0
Clay, silty to sandy, reddish brown.....	19.0	26.0
Clay, silty, gray.....	26.0	29.0
Sand, clayey, brown.....	29.0	37.0
Sand, silty, greenish gray.....	37.0	46.0
Gravel, coarse, contains extensive brown limestone..	46.0	51.0
Permian System - Big Blue Series - Admire Group:		
Shale, dark gray.....	51.0	57.0

Test Hole #66-40
1N 15E 8dddd
Richardson County

Location: SE corner, sec. 8, T. 1 N., R. 15 E., in southeast corner
of section.

Ground elevation: 918.8 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 9.40 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, silty, black.....	0.0	5.0
Clay, gray to buff.....	5.0	10.0
Clay, silty, gray to buff.....	10.0	20.0
Clay, silty, brown.....	20.0	25.0
Silt, gray to dark bluish gray.....	25.0	33.0
Silt, sandy, fine.....	33.0	38.0
Sand and gravel, fine, gray.....	38.0	47.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, gray, light bluish gray.....	47.5	49.0
Shale, hard, dark gray to greenish gray.....	49.0	50.0
Shale, dark gray.....	50.0	51.0

Test Hole #65-40
1N 15E 9cbcc
Richardson County

Location: Center west line SW sec. 9, T. 1 N., R. 15 E., on north edge of road, 25 feet east of intersection, 1,320 feet north of southwest corner of section.

Ground elevation: 918.40 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 20.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark gray to black.....	0.0	10.0
Clay, brown.....	10.0	19.0
Clay, silty, buff.....	19.0	25.0
Clay, silty, gray.....	25.0	34.0
Clay, sandy, greenish gray.....	34.0	37.0
Gravel, very coarse, contains limestone fragments and flint below 43.0 ft.....	37.0	46.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, greenish gray.....	46.0	48.0

Test Hole #67-40
1N 15E 9acdd
Richardson County

Location: SE SE SW NE sec. 9, T. 1 N., R. 15 E., 260 feet north of
 South Fork Nemaha River on west edge of road.
 Ground elevation: 912.8 feet (a) (Salem 7.5 min. quadrangle)
 Depth to water: 22.05 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, black.....	0.0	5.0
Clay, silty, dark to light gray.....	5.0	10.0
Clay, silty, reddish brown.....	10.0	21.0
Clay, silty, brown to gray.....	21.0	24.0
Silt, bluish gray, gravelly.....	24.0	28.0
Silt, sandy, gravelly.....	28.0	31.0
Gravel, gray, fine to coarse, contains shell and limestone fragments.....	31.0	39.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, gray.....	39.0	44.7
Limestone, calcareous.....	44.7	45.0
Shale, dark gray, contains extensive shells.....	45.0	49.0

Test Hole #68-40
1N 15E 9aada
Richardson County

Location: NE SE NE NE sec. 9, T. 1 N., R. 15 E., 792 feet south of
 northeast corner of section on west edge of road.

Ground elevation: 913.80 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 13.40 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brownish gray to black.....	0.0	7.0
Clay, silty, sandy, brownish gray.....	7.0	25.0
Silt, bluish gray.....	25.0	30.5
Sand and gravel, gray, fine to coarse.....	30.5	36.0
Gravel, gray, coarse, contains large limestone fragments.....	36.0	38.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, agrillaceous, bluish gray.....	38.0	39.0
Shale, gray.....	39.0	41.0

Test Hole #62-40
1N 15E 10addd
Richardson County

Location: Center east line sec. 10, T. 1 N., R. 15 E., on west edge
of road, 2,640 feet south of northeast corner of section.

Ground elevation: 905.00 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 20.60 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark gray to black.....	0.0	20.0
Clay, silty, greenish gray.....	20.0	30.0
Gravel, reddish brown, medium to coarse, contains some boulders.....	30.0	43.5
Shale, gray.....	43.5	45.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, hard, (no sample).....	45.0	

Test Hole #64-40
1N 15E 10baab
Richardson County

Location: NW NE NE NW sec. 10, T. 1 N., R. 15 E., at south edge of
the town of Salem at extension south on 2nd Street west.
Ground elevation: 910.0 feet (t) (Salem 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, sandy, dark brown.....	0.0	10.0
Clay, dark gray to black.....	10.0	20.0
Clay, silty, dark brownish gray.....	20.0	33.0
Sand, silty, greenish gray, trace of gravel.....	33.0	38.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, calcareous, dark gray.....	38.0	40.0
Limestone, or very hard calcareous shale.....	40.0	

Test Hole #70-40
1N 15E 10baac
Richardson County

Location: SW NE NE NW sec. 10, T. 1 N., R. 15 E., 300 feet south of
test hole 64-40.

Ground elevation: 910.0 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 16.40 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, sandy, dark brown.....	0.0	5.0
Clay, sandy, brown.....	5.0	34.0
Silt, bluish gray.....	34.0	40.0
Sand, gray.....	40.0	41.5
Sand and gravel, fine, gray.....	41.5	44.0
Gravel, gray, fine to coarse, contains limestone fragments below 46.0 ft, and shale below 47.5 ft..	44.0	50.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, calcareous, hard, gray.....	50.5	53.0
Shale, hard, gray to reddish gray.....	53.0	55.0

Test Hole #75-40
1N 15E 10bada
Richardson County

Location: NE SE NE NW sec. 10, T. 1 N., R. 15 E., south of Salem, 897 feet south of the northeast corner of the northwest quarter of section.

Ground elevation: 910.0 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 22.3 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey.....	0.0	4.0
Clay, dark grayish brown.....	4.0	14.0
Clay, sandy, brownish gray.....	14.0	30.0
Silt, sandy, bluish gray, trace of gravel at 35 ft..	30.0	41.0
Gravel, gray, fine to coarse, contains limestone fragments below 45.0 ft.....	41.0	49.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone boulders.....	49.0	50.0
Shale, greenish gray.....	50.0	52.0
Shale, calcareous, gray.....	52.0	54.0
Shale, calcareous, gray, with some purple tint.....	54.0	58.0

Test Hole #61-40
1N 15E 11bcbb
Richardson County

Location: Center west line NW sec. 11, T. 1 N., R. 15 E., east of
 curve in road, 1,320 feet south of northwest corner of
 section.

Ground elevation: 899.3 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 16.6 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, clayey, dark brownish gray.....	0.0	5.0
Clay, silty, brownish gray.....	5.0	20.0
Clay, silty, sandy, dark bluish gray.....	20.0	37.0
Sand, gray.....	37.0	41.0
Gravel, gray, fine to medium.....	41.0	50.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark gray.....	50.0	53.0
Limestone.....	53.0	

Test Hole #63-40
1N 15E 11cbcc
Richardson County

Location: SW SW NW SW sec. 11, T. 1 N., R. 15 E., 130 feet north of
 South Nemaha Ditch, on east edge of road 1,320 feet north of
 southwest corner of section.

Ground elevation: 898.4 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 17.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray to black.....	0.0	5.0
Clay, gray, with limonitic streaks.....	5.0	10.0
Clay, silty, brownish gray.....	10.0	22.0
Clay, silty to sandy, bluish gray.....	22.0	35.0
Gravel, rust-colored.....	35.0	36.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, calcareous, light bluish gray.....	36.5	39.0

Test Hole #25-40
1N 15E 12ddaa
Richardson County

Location: NE NE SE SE sec. 12, T. 1 N., R. 15 E., 1,108 feet north of
 southeast corner of section on west edge of road.

Ground elevation: 896.8 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 7.6 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, dark grayish brown.....	0.0	10.0
Silt, gray to buff, limonitic streaks.....	10.0	20.0
Gravel, gray, medium to coarse, limonitic streaks...	20.0	30.0
Sand and gravel, greenish gray, fine to medium.....	30.0	35.0
Gravel, green to gray, coarse.....	35.0	37.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark red to gray.....	37.0	39.0
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Test Hole #24-40
1N 15E 12ddddd
Richardson County

Location: SE corner sec. 12, T. 1 N., R. 15 E., 75 feet north of
 southeast corner of section on west edge of road.
 Ground elevation: 898.9 feet (a) (Salem 7.5 min. quadrangle)
 Depth to water: 17.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	4.0
Clay, silty, buff to gray.....	4.0	19.0
Silt, greenish gray.....	19.0	25.0
Gravel, gray and green, medium to coarse.....	25.0	39.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark red to gray, some red stain.....	39.0	43.5
Limestone.....	43.5	43.8
Shale, dark red to brick red.....	43.8	45.0

Test Hole #74-40
1N 15E 16cbbc
Richardson County

Location: SW NW NW SW sec. 16, T. 1 N., R. 15 E., 2,217 feet north of southwest corner of section on east edge of road.

Ground elevation: 964.0 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, loesslike, reddish brown.....	0.0	8.0
Clay, silty, buff, trace of gravel.....	8.0	26.0
Permian System - Big Blue Series - Admire Group:		
Limestone, weathered.....	26.0	27.5
Limestone, brown.....	27.5	28.5
Shale, gray.....	28.5	29.7
Limestone, hard, bluish gray.....	29.7	32.1

Test Hole #73-40
1N 15E 17ddad
Richardson County

Location: SE NE SE SE sec. 17, T. 1 N., R. 15 E., 150 feet west of road intersection and 897 feet north of southeast corner of section on north edge of road.

Ground elevation: 947.0 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 8.6 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, sandy, dark brown to black.....	0.0	5.0
Clay, silty, sandy, reddish brown.....	5.0	17.0
Silt, greenish to bluish gray, slightly sandy.....	17.0	25.0
Silt, dark bluish gray, slightly sandy and shaly....	25.0	32.0
Gravel, coarse, contains limestone and shale fragments.....	32.0	34.5
Permian System - Big Blue Series - Admire Group:		
Limestone, brownish to bluish gray.....	34.5	36.0
Shale, bluish gray, thin limestone lense at 36.5 ft.	36.0	39.0

Test Hole #152-40
1N 15E 30bada
Richardson County

Location: NE SE NE NW sec. 30, T. 1 N., R. 15 E., 2,640 feet east and
 897 feet south of the northwest corner of section.

Ground elevation: 1,003.0 feet (t) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 8.89 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, sandy, clayey, brown.....	0.0	9.0
Silt, grayish brown.....	9.0	13.0
Clay, sandy, greenish gray, contains limestone pebbles.....	13.0	16.0

Permian System - Big Blue Series - Council Grove Group:

Shale to limestone, chalky, buff.....	16.0	17.0
Shale, calcareous, yellow.....	17.0	17.5
Shale, bluish gray.....	17.5	18.0
Limestone, hard, bluish gray with black specks.....	18.0	19.0

Test Hole #25-A-67
1N 15E 36dadd
Richardson County

Location: SE SE NE SE sec. 36, T. 1 N., R. 15 E., 1,485 feet north
 and 7.7 feet west of southeast corner.

Ground elevation: 1,105.0 feet (Salem 7.5 min. quadrangle)

Depth to water: unknown

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	2.0
Silt, very clayey, dark grayish brown to brown, moderately clayey, yellowish brown below 8.0 ft...	2.0	9.0
Silt, slightly clayey, slightly sandy, brown, sand is very fine to coarse, below 10.0 ft. dark yellowish brown, below 12.5 ft sand is medium to very coarse, some fine gravel.....	9.0	13.2
Clay, silty, sandy, gravelly, yellowish brown.....	13.2	20.5
Till, clayey, silty, sandy, gravelly, slightly calcareous, light yellowish brown.....	20.5	25.5
Sand, fine to medium.....	25.5	28.4
Permian System - Big Blue Series - Council Grove Group:		
Foraker Formation:		
Long Creek Member:		
Shale, very pale brown.....	28.4	29.0
Lost Circulation at 29.0 ft.		

Test Hole #4-U-40
1N 16E 4addd
Richardson County

Location: SE SE SE NE sec. 4, T. 1 N., R. 16 E., 300 feet north of
the southeast corner of the northeast quarter of section.
Ground elevation: 1,000.0 feet (t) (Falls City 7.5 min. quadrangle)
Depth to water: 30.10 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey.....	0.0	5.0
Clay, buff, with limonitic stain.....	5.0	19.0
Sand, tan, very fine.....	19.0	30.0
Clay, sandy.....	30.0	40.0
Sand, medium to coarse, clayey below 47.0 ft.....	40.0	50.0
Clay, sandy.....	50.0	60.0
Gravel, medium to coarse, slightly clayey.....	60.0	85.0
Clay, blue, slightly sandy.....	85.0	97.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, black.....	97.5	99.0
Shale, sandy, gray, fine texture.....	99.0	102.5
Limestone, brown.....	102.5	103.0
Limestone and dark red shale.....	103.0	105.0
Shale, greenish gray.....	105.0	109.0
Shale, blue.....	109.0	113.0
Limestone, hard.....	113.0	113.5
Shale, blue.....	113.5	129.0
Shale, bluish gray.....	129.0	132.5
Limestone, gray, some shale.....	132.5	134.5

Test Hole #3-U-40
1N 16E 5adaa
Richardson County

Location: Center east line NE sec. 5, T. 1 N., R. 16 E., 1,320 feet
 south and 15 feet west of northeast corner of section.
 Ground elevation: 1,012.0 feet (t) (Salem 7.5 min. quadrangle)
 Depth to water: 18.5 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	5.0
Clay, gravelly, medium.....	5.0	45.0
Permian System - Big Blue Series - Admire Group:		
Shale, bluish gray (probably till).....	45.0	50.0
Shale, bluish gray to yellowish green (probably till).....	50.0	94.5
Limestone, black.....	94.5	96.0

Test Hole #26-40
1N 16E 7cbbc
Richardson County

Location: SW NW NW SW sec. 7, T. 1 N., R. 16 E., 2,112 feet north of
southwest corner of section.
Ground elevation: 903.0 feet (a) (Salem 7.5 min. quadrangle)
Depth to water: 4.95 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark grayish brown to black.....	0.0	12.0
Clay, silty, buff to gray, with limonitic streaks...	12.0	19.0
Silt, greenish gray.....	19.0	25.5
Gravel, yellow, medium to coarse, contains limestone pebbles below 35.0 ft.....	25.5	38.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark red to gray, some red stain.....	38.5	42.0

Test Hole #9-40
1N 16E 15ddad
Richardson County

Location: SE NE SE SE sec. 15, T. 1 N., R. 16 E., 264 feet south of
 Missouri Pacific Railroad tracks, approximately 950 feet north of
 southeast corner of section.

Ground elevation: 886.1 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 6.73 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown.....	0.0	6.0
Clay, greenish gray.....	6.0	14.0
Clay, gray, with limonitic streaks.....	14.0	20.0
Clay, sandy, gray.....	20.0	27.0
Gravel, gray, medium.....	27.0	39.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, sandstone, gray.....	39.5	45.0
Sandstone, gray.....	45.0	47.0
Shale, gray.....	47.0	49.0

Test Hole #1-40
1N 16E 16bada
Richardson County

Location: NE SE NE NW sec. 16, T. 1 N., R. 16 E., 686 feet south of
the northeast corner of the northwest quarter of the section.
Ground elevation: 915.2 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 17.9 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, reddish brown.....	0.0	5.0
Clay, limonitic, reddish brown.....	5.0	9.5
Clay, greenish gray, with limonitic streaks.....	9.5	15.0
Clay, sandy, reddish brown.....	15.0	20.0
Sand, clayey, gray to yellowish brown, contains water-worn red shale.....	20.0	25.0
Sand, buff, coarse.....	25.0	30.0
Gravel, fine to coarse.....	30.0	34.0
Silt, clayey, buff to gray, sandy below 50.0 ft.....	34.0	56.0
Sand and gravel, fine, coarse below 60 ft.....	56.0	62.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark bluish gray.....	62.0	65.0
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Test Hole #2-40
1N 16E 16acbb
Richardson County

Location: NW NW SW NE sec. 16, T. 1 N., R. 16 E., 1,584 feet south
 and 2,640 feet west of northeast corner of section.

Ground elevation: 904.4 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 23.95 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, brown.....	0.0	5.0
Clay, brown to black.....	5.0	10.0
Clay, greenish gray, contains limonitic streaks below 15 ft.....	10.0	18.5
Clay, silty, limonitic, light gray.....	18.5	29.0
Clay, silty, dark gray.....	29.0	36.0
Sand and gravel, fine to coarse.....	36.0	40.0
Sand, coarse, contains white quartz.....	40.0	45.0
Gravel, fine to medium, contains large boulders below 49.0 ft.....	45.0	52.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, bluish black.....	52.5	54.0
Limestone, hard, no sample.....	54.0	

Test Hole #2-U-40
1N 16E 16bbac
Richardson County

Location: SW NE NW NW sec. 16, T. 1 N., R. 16 E., 792 feet east and
 375 feet south of northwest corner of section.
 Ground elevation: 945.0 feet (t) (Salem 7.5 min. quadrangle)
 Depth to water: 13.4 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, clayey, brown.....	0.0	5.0
Clay, brown.....	5.0	11.0
Clay, tan, limonitic streaks.....	11.0	15.0
Clay, buff.....	15.0	24.0

Permian System - Big Blue Series - Admire Group:

Shale, bluish gray, dark red, greenish gray.....	24.0	58.0
Shale, bluish green, some brown.....	58.0	105.0
Limestone, hard, greenish gray, iron stained.....	105.0	109.5
Shale, carbonaceous, black.....	109.5	110.0

Test Hole #3-40
1N 16E 16dbbb
Richardson County

Location: NW corner SE sec. 16, T. 1 N., R. 16 E., 95 feet east and
 15 feet south of the center of the section.

Ground elevation: 886.7 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black to dark brown.....	0.0	9.0
Clay, silty, contains limonitic material.....	9.0	12.0
Clay, gray, limonitic staining.....	12.0	17.0
Silt, green.....	17.0	20.0
Clay, silty, dark greenish brown to black.....	20.0	23.0
Silt, gray.....	23.0	28.5
Gravel and sand, fine to coarse.....	28.5	40.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, grayish green, contains some flint.....	40.0	40.5

Test Hole #4-40
1N 16E 16dcbb
Richardson County

Location: NW corner SW SE sec. 16, T. 1 N., R. 16 E., 1,360 feet
 south of center of section on east edge of road.
 Ground elevation: 888.3 feet (a) (Falls City 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, brownish gray.....	0.0	7.0
Clay, silty, gray, with limonitic streaks.....	7.0	14.0
Clay, silty, gray to greenish gray, with limonitic streaks.....	14.0	19.0
Clay, silty, sandy, greenish gray.....	19.0	22.0
Gravel, medium to coarse.....	22.0	34.3
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, hard.....	34.3	34.8

Test Hole #5-40
1N 16E 16dccc
Richardson County

Location: SW corner SE sec. 16, T. 1 N., R. 16 E., on east edge of road, 30 feet north of the southwest corner of the southeast quarter of the section.

Ground elevation: 889.3 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown.....	0.0	5.0
Clay, light brownish gray, some limonitic staining.	5.0	10.0
Clay, silty, buff.....	10.0	17.0
Gravel, yellow, fine to coarse.....	17.0	25.0
Sand and gravel, yellow to brown, fine to medium...	25.0	29.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Gravel, blue, gray, green, fine to coarse.....	29.0	38.0
Limestone, hard.....	38.0	38.1

Test Hole #21-40
1N 16E 18ccbb
Richardson County

Location: Center west line SW sec. 18, T. 1 N., R. 16 E., on east edge of road about 1,320 feet north of the southwest corner of section.

Ground elevation: 898.95 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 14.75 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, black to dark gray.....	0.0	7.0
Clay, silty, buff to gray, with limonitic stain.....	7.0	25.0
Silt, sandy, greenish gray.....	25.0	31.0
Gravel, medium to coarse, yellow to brown.....	31.0	38.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, black.....	38.0	40.0
Limestone.....	40.0	

Test Hole #22-40
1N 16E 18bccc
Richardson County

Location: SW SW SW NW sec. 18, T. 1 N., R. 16 E., on east edge of road, 2,376 feet south of the northwest corner of section.

Ground elevation: 899.0 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark grayish brown to black.....	0.0	8.0
Clay, silty, buff to gray.....	8.0	20.0
Clay, light grayish brown.....	20.0	27.0
Clay, silty, sandy, greenish gray.....	27.0	35.0
Sand and gravel, fine, yellowish brown.....	35.0	40.0
Gravel, fine to coarse, yellowish brown.....	40.0	46.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light bluish gray.....	46.0	49.0

Test Hole #23-40
1N 16E 18bbcc
Richardson County

Location: SW SW NW NW sec. 18, T. 1 N., R. 16 E., on east edge of road, 1,214 feet south of northwest corner of section.

Ground elevation: 899.2 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 5.90 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clay, dark grayish brown to black.....	0.0	5.0
Clay, silty, buff to greenish gray.....	5.0	20.0
Clay, silty, sandy, greenish gray, with limonitic streaks.....	20.0	31.0
Gravel, dark gray, poorly sorted.....	31.0	34.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, or large boulders.....	34.0	35.0
Shale, black.....	35.0	36.0
Limestone, very hard.....	36.0	36.1

Test Hole #19-40
1N 16E 19bcbb
Richardson County

Location: Center west line NW sec. 19, T. 1 N., R. 16 E., on east
 edge of road, 1,320 feet south of northwest corner of section.
 Ground elevation: 906.2 feet (a) (Salem 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown to black.....	0.0	5.0
Clay, silty, grayish brown.....	5.0	20.0
Clay, silty, greenish gray.....	20.0	31.0
Gravel, fine to coarse, green and bluish gray.....	31.0	37.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark gray.....	37.0	39.0

Test Hole #20-40
1N 16E 19bbbb
Richardson County

Location: NW NW NW NW sec. 19, T. 1 N., R. 16 E., 200 feet south of
northwest corner of section.

Ground elevation: 902.0 feet (Salem 7.5 min. quadrangle)

Depth to water: 11.9 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, brownish gray.....	0.0	15.0
Clay, silty, buff to gray, limonitic streaks.....	15.0	33.0
Gravel, red to brown, coarse.....	33.0	38.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, light gray.....	38.5	41.0
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Test Hole #6-40
1N 16E 21badd
Richardson County

Location: SE SE NE NW sec. 21, T. 1 N., R. 16 E., 2,630 feet east and
 and 1,056 feet south of northwest corner of section.

Ground elevation: 888.3 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 19.6 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown.....	0.0	5.0
Clay, greenish gray, with limonitic streaks.....	5.0	10.0
Clay, silty, gray.....	10.0	15.0
Clay, sandy, gray.....	15.0	19.0
Gravel, brownish red, fine to coarse.....	19.0	23.0
Clay, silty, sandy, blue.....	23.0	25.0
Gravel, green, blue, black.....	25.0	36.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone and shale, contains limestone fragments...	36.0	39.0
Shale, gray, contains mica.....	39.0	

Test Hole #7-40
1N 16E 21bdda
Richardson County

Location: NE SE SE NW sec. 21, T. 1 N., R. 16 E., 100 feet west and
 528 feet north of center of section.
 Ground elevation: 889.8 feet (a) (Falls City 7.5 min. quadrangle)
 Depth to water: 16.1 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brown.....	0.0	10.0
Clay, silty, brown.....	10.0	20.0
Clay, sandy, brown.....	20.0	28.0
Clay, silty, bluish gray.....	28.0	39.0
Gravel, coarse, contains limestone pebbles and boulders.....	39.0	45.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray, contains mica.....	45.0	49.0

Test Hole #8-40
1N 16E 21cbdd
Richardson County

Location: SE SE NW SW sec. 21, T. 1 N., R. 16 E., 1,320 feet east and
1,478 feet north of the southwest corner of section.
Ground elevation: 891.0 feet (a) (Salem 7.5 min. quadrangle)
Depth to water: 17.7 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown.....	0.0	5.0
Clay, sandy, brown.....	5.0	21.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, hard.....	21.0	22.0

Test Hole #10-40
1N 16E 22aaaa
Richardson County

Location: NE NE NE NE sec. 22, T. 1 N., R. 16 E., 20 feet west of
road, 264 feet south of the northeast corner of section.
Ground elevation: 882.9 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 4.3 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Till, clayey, black.....	0.0	5.0
Clay, gray, with limonitic streaks.....	5.0	23.0
Sand and gravel, dark gray, fine to medium.....	23.0	29.0
Clay, gray.....	29.0	30.0
Gravel, dark gray, fine to coarse.....	30.0	42.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone or sandstone, gray.....	42.5	45.0
Shale, dark gray.....	45.0	49.0

Test Hole #12-40
1N 16E 22addd
Richardson County

Location: SE SE SE NE sec. 22, T. 1 N., R. 16 E., 40 feet west of
 highway, 2,534 feet south of northeast corner of section.

Ground elevation: 878.6 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 16.9 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brown, with limonitic streaks.....	0.0	27.0
Clay, silty, bluish gray.....	27.0	37.0
Gravel, fine to coarse, contains limestone fragments	37.0	43.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark gray, contains mica.....	43.5	45.0

Test Hole #13-40
1N 16E 22ddaa
Richardson County

Location: Center east line SE sec. 22, T. 1 N., R. 16 E., 1,320 feet
north of southeast corner of section.

Ground elevation: 882.9 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 23.2 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brown.....	0.0	15.0
Clay, medium brown.....	15.0	25.0
Clay, silty, dark gray.....	25.0	30.0
Silt, sandy, dark gray.....	30.0	35.0
Sand and gravel.....	35.0	40.0
Gravel, coarse, dark gray, some limestone and shale below 45.0 ft.....	40.0	47.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark gray.....	47.0	49.0

Test Hole #17-40
1N 16E 22ddcb
Richardson County

Location: NW SW SE SE sec. 22, T. 1 N., R. 16 E., on north edge of road, 1,320 feet west and 528 feet north of southeast corner of section.

Ground elevation: 886.0 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 11.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown to black.....	0.0	5.0
Clay, dark grayish brown.....	5.0	14.0
Clay, silty, dark brown.....	14.0	20.0
Clay, silty, sandy, brownish gray, slightly gravelly from 21.5 - 22.0 ft.....	20.0	22.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, crystalline, hard, light brown.....	22.0	22.5

Test Hole #18-40
1N 16E 22ccdd
Richardson County

Location: SE SE SW SW sec. 22, T. 1 N., R. 16 E., on north edge of
road, 1,161 feet east of southwest corner of section.
Ground elevation: 893.0 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 8.9 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, silty.....	0.0	5.0
Clay, silty, greenish gray, with limonitic streaks..	5.0	17.0
Clay, silty, dark brown.....	17.0	20.0
Clay, silty, gray, with limonitic streaks.....	20.0	25.0
Clay, silty, bluish gray.....	25.0	31.0
Gravel, multi-colored, medium to coarse.....	31.0	36.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, hard, light gray.....	36.0
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Test Hole #11-40
1N 16E 23bcbb
Richardson County

Location: NW NW SW NW sec. 23, T. 1 N., R. 16 E., on east edge of
road, 1,478 feet south of northwest corner of section.

Ground elevation: 884.0 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 5.75 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brown to black.....	0.0	7.0
Clay, greenish gray, with limonitic streaks.....	7.0	19.0
Silt, greenish gray.....	19.0	36.0
Gravel, dark gray, coarse.....	36.0	39.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone.....	39.0	41.0
Shale, dark gray, contains mica.....	41.0	44.0

Test Hole #28-40
1N 16E 25adda
Richardson County

Location: NE SE SE NE sec. 25, T. 1 N., R. 16 E., on bank west of
road, 2,112 feet south of northeast corner.

Ground elevation: 878.2 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 22.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	2.0
Clay, slightly sandy, dark brown.....	2.0	15.0
Clay, sandy, contains limonitic concretions.....	15.0	25.0
Silt, gray.....	25.0	31.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray.....	31.0	35.0
Limestone or boulder, very hard.....	35.0	

Test Hole #52-40
1N 16E 25abab
Richardson County

Location: NW NE NW NE sec. 25, T. 1 N., R. 16 E., on south edge of
road, 1,795 feet west of northeast corner.
Ground elevation: 884.6 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 17.3 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	3.0
Clay, dark gray to brown.....	3.0	15.0
Clay, silty, buff to gray.....	15.0	30.0
Gravel, red and rust, medium to coarse, contains limestone chips.....	30.0	37.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, dark brown to gray.....	37.5	38.5
Shale, dark gray.....	38.5	39.5
Limestone, dark brownish gray.....	39.5	40.0
Shale, light gray.....	40.0	41.0

Test Hole #26-A-67

1N 16E 31bccc

Richardson County

Location: SW SW SW NW sec. 31, T. 1 N., R. 16 E., 2,427 feet and 6 feet east of northwest corner.

Ground elevation: 1,059.5 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 6.44 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill.....	0.0	0.9
Silt, moderately clayey, dark gray, below 3.0 ft. very dark gray, much organic matter.....	0.9	6.0
Silt, clayey, gray, some manganese pellets, below 11.0 ft grayish brown, trace of fine sand.....	6.0	11.4
Silt, slightly clayey, sandy, light brownish gray, sand is very fine to medium.....	11.4	12.0
Clay, silty, sandy, light yellowish brown, sand is very fine to medium, below 16.7 ft sand is very fine to very coarse.....	12.0	16.7
Gravel, sandy, clayey, silty, very fine sand to cobbles.....	16.7	17.4

Permian System - Big Blue Series - Council Grove Group:**Foraker Formation:****Hughes Creek Member:**

Shale, pale olive, mottled with yellow, interbedded with pale yellow very finely crystalline limestone.....	17.4	21.0
Shale, light gray, mottled with pale olive.....	21.0	23.2
Shale, medium gray, mottled with yellow.....	23.2	24.4
Shale, medium to dark gray, mottled with yellow.....	24.4	25.0
Shale, medium to dark gray, clayey.....	25.0	28.5
Shale, medium to dark gray, some black mottling, contains brachiopods and pelecypods.....	28.5	29.0
Shale, medium gray.....	29.0	29.7

Americus Member:

Limestone, medium to dark gray, very finely crystalline, contains pyrite, brachiopods fragments, shaly.....	29.7	30.5
Limestone, medium to dark gray.....	30.5	30.9
Shale, dark gray to black.....	30.9	31.5
Shale, black carbonaceous.....	31.5	31.9
Limestone, medium to dark gray, finely crystalline, contains brachiopod fragments.....	31.9	33.0

Admire Group:**Hamlin Formation:****Oaks Member:**

Shale, medium to dark gray.....	33.0	34.8
Shale, light greenish gray, interbedded with light greenish gray limestone seams.....	34.8	35.5
Limestone, light greenish gray, finely crystalline..	35.5	35.6
Shale, light greenish gray, interbedded with light greenish gray limestone seams.....	35.5	40.0
Shale, light greenish gray, with some gypsum.....	40.0	41.9
Shale, light greenish gray, with interbedded limestone seams.....	41.9	45.0
Shale, greenish gray with trace of red mottling....	45.0	46.8
Limestone, light greenish gray, contains very fine mica, interbedded with shale and gypsum.....	46.8	47.2
Shale, pale olive.....	47.2	50.0
Shale, medium olive, mottled with brown.....	50.0	52.0

Houchens Creek Member:

Dolomite Limestone, light brown, very finely crystalline, interbedded with shale.....	52.0	52.5
Dolomite Limestone, light brown, interbedded with pale olive shale.....	52.5	52.7
Dolomite Limestone, light brown, very finely crystalline, interbedded with medium gray, contains shale and very fine mica.....	52.7	53.5

Stine Member:

Shale, light to medium gray, contains very fine mica	53.5	54.5
Shale, olive, with brown and black carbonaceous material.....	54.5	55.5
Sandstone, light greenish gray, very finely grained, contains very fine mica.....	55.5	58.0
Sandstone, light gray, very finely grained, contains very fine mica.....	58.0	59.5
Shale, light gray.....	59.5	64.4
Shale, dark gray to black.....	64.4	65.0
Limestone, medium to dark gray, very finely crystalline, contains brachiopod fragments, interbedded with gray shale.....	65.0	67.8
Shale, light greenish gray, interbedded with dark gray limestone.....	67.8	72.0
Shale, olive, mottled with dark yellowish brown....	72.0	73.5
Shale, pale olive, mottled with dark yellowish brown and pale red.....	73.5	76.0
Shale, dark gray, clayey.....	76.0	76.6

Five Point Formation:

Limestone, light brown, dense to very finely crystalline, "algal," <u>Osagia</u>	76.6	77.3
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West Branch Formation:

Sandstone, light gray, very finely grained, contains very fine mica.....	77.3	77.5
Shale, light and medium gray, contains very fine mica.....	77.5	81.0
Sandstone, light gray, very finely grained, contains very fine mica, shaly.....	81.0	86.3
Limestone, light greenish gray, very finely crystalline, interbedded with shale, light greenish gray.....	86.3	90.5

Test Hole #151-40
1N 16E 33baaa
Richardson County

Location: NE NE NE NW sec. 33, T. 1 N., R. 16 E., on south edge of
road 2,376 feet east of northwest corner of section.
Ground elevation: 905.0 feet (t) (Falls City 7.5 min. quadrangle)
Depth to water: 14.45 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Sand, clayey, brown.....	0.0	18.0
Clay, sandy, gray.....	18.0	21.0
Gravel, coarse, contains large limestone chips and pieces of weathered shale.....	21.0	25.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Sandstone, gray.....	25.0	26.0
Shale, sandy, interbedded with sandstone, contains thin layer of coal at 26.0 ft.....	26.0	34.0
Shale, bluish gray.....	34.0	37.0
Limestone, brownish gray.....	37.0	37.5

Test Hole #53-40
1N 16E 36badd
Richardson County

Location: SE SE NE NW sec. 36, T. 1 N., R. 16 E., on north edge of road, 200 feet west of half section line and 1,320 feet south and 2,692 feet west of northeast corner of section.

Ground elevation: 882.7 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 7.8 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, dark brown.....	0.0	5.0
Clay, grayish brown.....	5.0	15.0
Clay, silty, light brown.....	15.0	23.0
Clay, silty, bluish gray.....	23.0	35.0
Gravel, greenish gray, fine to medium.....	35.0	40.0
Gravel, gray to yellowish gray, medium to coarse, contains large limestone boulders below 47.0 ft...	40.0	49.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, light gray.....	49.5	52.0
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Test Hole #54-40
1N 16E 36aadd
Richardson County

Location: SE SE NE NE sec. 36, T. 1 N., R. 16 E., on north edge of road, 1,320 feet south and 150 feet west of northeast corner of section.

Ground elevation: 895.2 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 11.25 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, sandy, dark brown.....	0.0	4.0
Clay, sandy, black.....	4.0	7.0
Clay, dark gray.....	7.0	15.0
Clay, silty, buff.....	15.0	19.0
Silt, sandy, greenish gray.....	19.0	30.0
Silt, sandy, dark bluish gray.....	30.0	41.0
Gravel, green, medium.....	41.0	48.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone boulder or weathered limestone.....	48.0	49.0
Shale, weathered, yellow.....	49.0	50.0
Shale, calcareous, fossiliferous, bluish gray.....	50.0	51.5

Test Hole #55-40
1N 16E 36bbdc
Richardson County

Location: SW SE NW NW sec. 36, T. 1 N., R. 16 E., on north edge of road, 1,320 feet south and 792 feet east of the northwest corner of section.

Ground elevation: 882.4 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 12.9 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, sandy, dark brown.....	0.0	9.0
Clay, silty, brownish gray.....	9.0	15.0
Clay, silty, sandy, gray, with limonitic streaks....	15.0	25.0
Clay, silty, sandy, greenish gray.....	25.0	37.0
Gravel, fine to coarse, contains some shale and limestone below 44.0 ft.....	37.0	47.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, rust-colored, weathered.....	47.0	48.0
Shale, gray, contains mica.....	48.0	66.0
Limestone, very hard.....	66.0	67.0

Test Hole #16-U-40
1N 17E 3babb
Richardson County

Location: NW NW NE NW sec. 3, T. 1 N., R. 17 E., .3 mile east and
 150 feet south of the northwest corner.

Ground elevation: 1,040.0 feet (t) (Rulo 7.5 min. quadrangle)

Depth to water: 86.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	2.0
Clay, tan.....	2.0	27.0
Clay, light brown to reddish brown.....	27.0	72.0
Clay, buff.....	72.0	79.0
Clay, sandy.....	79.0	86.0
Clay, brown to gray, slightly gravelly.....	86.0	99.0
Clay, gray, contains limestone fragments.....	99.0	102.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, brown.....	102.0	103.0

Test Hole #14-40
1N 17E 6cccb
Richardson County

Location: NW SW SW SW sec. 6, T. 1 N., R. 17 E., on east edge of
road, 528 feet north of southwest corner of section.

Ground elevation: 888.0 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 16.1 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, silty.....	0.0	20.0
Sand, silty.....	20.0	29.0
Gravel, poorly sorted.....	29.0	31.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, light gray.....	31.0	39.0
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Test Hole #15-40
1N 17E 6cbcb
Richardson County

Location: NW SW NW SW sec. 6, T. 1 N., R. 17 E., on east edge of
road, 1,953 feet north of southwest corner of section.

Ground elevation: 879.7 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 15.6 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Till, clayey, dark brown.....	0.0	10.0
Clay, silty, brown.....	10.0	26.0
Sand, silty, brown.....	26.0	28.0
Sand and gravel, gray, fine to coarse.....	28.0	37.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light gray.....	37.5	39.0

Test Hole #16-40
1N 17E 6bccb
Richardson County

Location: NW SW SW NW sec. 6, T. 1 N., R. 17 E., on east edge of
road, 3,062 feet north of southwest corner of section.
Ground elevation: 864.1 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brown to black.....	0.0	9.0
Clay, brownish gray.....	9.0	14.0
Clay, silty, light brown.....	14.0	20.0
Silt, bluish gray.....	20.0	27.0
Sand and gravel, silty, gray, poorly sorted.....	27.0	36.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light gray.....	36.0	39.0

Test Hole #46-40
1N 17E 16bbba
Richardson County

Location: NE NW NW NW sec. 16, T. 1 N., R. 17 E., 450 feet east and
 300 feet south of northwest corner of section.
 Ground elevation: 867.9 feet (a) (Falls City 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, brown.....	0.0	15.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, reworked, greenish gray.....	15.0	17.0
Limestone, very hard.....	17.0	17.5

Test Hole #47-40
1N 17E 16bbbc
Richardson County

Location: SW NW NW NW sec. 16, T. 1 N., R. 17 E., on east edge of
road, 528 feet south of northwest corner of section.
Ground elevation: 869.9 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 14.4 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Silt, sandy, brown.....	0.0	10.0
Silt, dark gray to black.....	10.0	27.0
Silt, sandy, slightly gravelly, fine.....	27.0	33.0
Gravel, gray, fine to medium.....	33.0	38.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, gray.....	38.5	41.0
Limestone, very hard.....	41.0	

Test Hole #48-40
1N 17E 16bccc
Richardson County

Location: SW SW SW NW sec. 16, T. 1 N., R. 17 E., 10 feet east of
 fence on east side of road, 2,640 feet south of northwest corner
 of section.

Ground elevation: 870.9 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 18.2 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown to black.....	0.0	2.0
Clay, sandy, loesslike, brown.....	2.0	25.0
Clay, silty, sandy, bluish gray.....	25.0	36.0
Gravel, fine to coarse, contains limestone chips below 39.0 ft.....	36.0	43.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, hard, gray, contains sandstone layer at 44.0 ft.....	43.0	45.0

Test Hole #49-40
1N 17E 20aaaa
Richardson County

Location: NE NE NE NE sec. 20, T. 1 N., R. 17 E., on west side of
road, 225 feet south of the northeast corner of section.
Ground elevation: 868.9 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, dark gray.....	0.0	10.0
Clay, buff to gray, with limonitic streaks.....	10.0	25.0
Clay, silty, sandy, brownish gray.....	25.0	30.0
Silt, bluish gray.....	30.0	33.0
Sand, silty to clayey.....	33.0	35.0
Gravel, reddish gray, medium to coarse, contains limestone pebbles below 39.0 ft.....	35.0	46.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, hard, brown, possibly boulder.....	46.0	49.0
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Test Hole #50-40
1N 17E 20addd
Richardson County

Location: SE SE SE NE sec. 20, T. 1 N., R. 17 E., 225 feet north of
 railroad tracks, 2,640 feet south of northeast corner of section.
 Ground elevation: 864.9 feet (a) (Falls City 7.5 min. quadrangle)
 Depth to water: 14.9 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, dark brownish gray to black.....	0.0	5.0
Clay, brownish gray.....	5.0	10.0
Clay, silty, sandy, buff.....	10.0	26.0
Silt, sandy, slightly clayey, bluish gray.....	26.0	30.0
Gravel, fine to medium, contains wood fragments at 37.0 ft.....	30.0	39.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark gray.....	39.5	45.0

Test Hole #44-40
1N 17E 23addd
Richardson County

Location: Center east line sec. 23, T. 1 N., R. 17 E., on west side
of road, 2,640 feet south of northeast corner of section.

Ground elevation: 861.7 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 14.15 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, silty.....	0.0	5.0
Clay, silty, gray.....	5.0	26.0
Clay, silty, sandy, olive green.....	26.0	36.0
Gravel, medium to coarse.....	36.0	50.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, light gray.....	50.0	51.0
Limestone, hard, dark gray.....	51.0	

Test Hole #45-40
1N 17E 23ddda
Richardson County

Location: NE SE SE SE sec. 23, T. 1 N., R. 17 E., 528 feet north of
 southeast corner of section.

Ground elevation: 854.3 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 11.65 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, silty, black.....	0.0	5.0
Clay, silty, gray to brown.....	5.0	15.0
Clay, silty, brownish gray.....	15.0	20.0
Clay, sandy, brownish gray.....	20.0	25.0
Silt, gray, slightly gravelly, fine.....	25.0	45.0
Sand and gravel, gray, fine to coarse.....	45.0	49.0
Sand, light gray, contains shell fragments.....	49.0	56.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray.....	56.0	59.0

Test Hole #42-40
1N 17E 24bbbc
Richardson County

Location: SW NW NW NW sec. 24, T. 1 N., R. 17 E., on east edge of road, 528 feet south of northwest corner of section.

Ground elevation: 873.5 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, sandy, dark brown.....	0.0	5.0
Clay, sandy, loesslike, reddish brown.....	5.0	26.0
Clay, sandy, gray.....	26.0	28.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, red and gray.....	28.0	36.0
Shale, sandy, bluish gray.....	36.0	39.0
Shale, olive gray.....	39.0	42.0

Test Hole #43-40
1N 17E 24bcbb
Richardson County

Location: NW NW SW NW sec. 24, T. 1 N., R. 17 E., on east edge of road, 1,531 feet south of the northwest corner of section.

Ground elevation: 868.0 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, silt, sandy, brown.....	0.0	5.0
Clay, silty, black, granular.....	5.0	10.0
Clay, silty, gray.....	10.0	35.0

Test Hole #27-40
1N 17E 30bbcc
Richardson County

Location: SW SW NW NW sec. 30, T. 1 N., R. 17 E., on east edge of road, 1,267 feet south of northwest corner of section.
 Ground elevation: 883.1 feet (a) (Falls City 7.5 min. quadrangle)
 Depth to water: 22.5 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, sandy, brown.....	0.0	30.0
Sand, silty, gray.....	30.0	35.0
Sand and gravel, bluish gray.....	35.0	38.0
Gravel, yellow, brown, fine to coarse, contains some sand below 47.0 ft, and limestone chips below 51.0 ft.....	38.0	53.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray, with some red.....	53.5	58.0

Test Hole #51-40
1N 17E 30bbbb
Richardson County

Location: NW corner, sec. 30, T. 1 N., R. 17 E.

Ground elevation: 875.7 feet (t) (Falls City 7.5 min. quadrangle)

Depth to water: 22.1 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	3.0
Clay, silty, buff.....	3.0	28.0
Clay, sandy, buff, slightly gravelly.....	28.0	33.0
Sand, silty, blue.....	33.0	37.0
Gravel, gray, fine.....	37.0	41.0
Gravel, red, fine to coarse.....	41.0	43.5
Gravel, very coarse, contains flint and limestone fragments.....	43.5	45.0
Gravel, light yellowish gray, fine.....	45.0	50.0
Gravel, fine to coarse.....	50.0	53.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, rust-colored, hard.....	53.0	55.5

Test Hole #14-U-40**1N 17E 32aaaa****Richardson County**

Location: NE corner sec. 32, T. 1 N., R. 17 E.

Ground elevation: 1,020.0 feet (t) (Falls City 7.5 min. quadrangle)

Depth to water: not measured

<u>Depth, in feet</u>	
From	To

Quaternary System, undifferentiated:

Soil, clayey, black.....	0.0	2.0
Clay, buff, with limestone stains.....	2.0	9.0
Clay, dark brown.....	9.0	19.0
Clay, yellow.....	19.0	23.0
Sand, clayey, fine to medium texture.....	23.0	30.0
Clay, yellow, slightly sandy, white.....	30.0	41.0
Clay, sandy, brown, slightly gravelly.....	41.0	48.0
Clay, fossiliferous, brown.....	48.0	49.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, bluish black.....	49.0	51.0
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Test Hole #15-U-40
1N 18E 18bdc
Richardson County

Location: SW SE NW sec. 18, T. 1 N., R. 18 E., 450 feet south and
 180 feet west of house.

Ground elevation: 1,000.0 feet (t) (Rulo 7.5 min. quadrangle)

Depth to water: 41.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	1.0
Clay, brown.....	1.0	10.0
Clay, buff.....	10.0	26.0
Clay, pinkish brown, with iron staining.....	26.0	40.0
Clay, sandy.....	40.0	44.0
Clay, light tan to brown, slightly sandy.....	44.0	48.0
Clay, brown to gray, contains isolated chalky material.....	48.0	50.0
Clay, silty, grayish white, contains iron-stained pebbles.....	50.0	58.0
Boulder, no sample.....	58.0	60.0
Clay, light tan, contains some chalky rock, white...	60.0	64.0
Clay, sandy.....	64.0	68.0
Clay, gray, contains cemented sand and boulder.....	68.0	79.0
Clay, yellow, slightly sandy, fine.....	79.0	81.0
Clay, very sandy, fine.....	81.0	88.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, bluish gray, tan.....	88.0	98.0
Limestone, very hard, gray.....	98.0	

Test Hole #1-U-40
1N 18E 27badb
Richardson County

Location: NW SE NE NW sec. 27, T. 1 N., R. 18 E.
 Ground elevation: 860.0 feet (t) (Rulo 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, shale and limestone.....	0.0	16.0
Silt, black.....	16.0	24.0
Clay, bluish gray.....	24.0	27.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Sand, fine.....	27.0	30.0
Sandstone, fine, contains shale below 33.0 ft.....	30.0	49.5
Coal.....	49.5	49.8
Limestone, gray, contains fossils and some shale....	49.8	58.5
Sandstone, gray.....	58.5	78.0
Shale, gray, contains some coal.....	78.0	79.0
Sandstone, calcareous, contains a coal seam.....	79.0	81.0
Sandstone, gray, fine.....	81.0	85.0
Sandstone, fine, contains coal seams.....	85.0	89.2
Sandstone and shale.....	89.2	102.0
Limestone, dark gray.....	102.0	103.0

Test Hole #33-40
1N 18E 29adaa
Richardson County

Location: NE NE SE NE sec. 29, T. 1 N., R. 18 E., 12 feet north of road, 45 feet west of section line, 1,320 feet south of the northeast corner of section.

Ground elevation: 841.4 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 12.1 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, silty, clayey, dark grayish brown.....	0.0	3.0
Clay, silty, buff to gray.....	3.0	25.0
Sand, gray, fine.....	25.0	36.0
Gravel, gray, fine to coarse.....	36.0	60.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale or limestone, hard.....	60.0	

Test Hole #34-40
1N 18E 30ddaa
Richardson County

Location: NE NE SE SE sec. 29, T. 1 N., R. 18 E., 1,108 feet north of
 southeast corner of section.

Ground elevation: 852.0 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 10.4 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, sandy, dark brown.....	0.0	5.0
Clay, sandy, gray to brown.....	5.0	12.0
Sand, silty.....	12.0	20.0
Gravel, fine to coarse.....	20.0	29.0
Sand and gravel.....	29.0	34.0
Gravel, fine to coarse.....	34.0	49.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale.....	49.0	54.0
Coal.....	54.0	54.1
Shale, gray.....	54.1	57.0
Limestone, hard, dark gray.....	57.0	58.0

Test Hole #38-40
1N 18E 30accc
Richardson County

Location: SW SW SW NE sec. 30, T. 1 N., R. 18 E., 150 feet east and
 2,640 feet south of the northeast corner of section.
 Ground elevation: 859.9 feet (a) (Rulo 7.5 min. quadrangle)
 Depth to water: 16.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, silty, dark brown.....	0.0	5.0
Clay, silty, light brown.....	5.0	10.0
Clay, silty, sandy, buff, gray streaks.....	10.0	36.0
Gravel, gray, blue, fine to coarse, large limestone pieces below 54.0 ft.....	36.0	59.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone or limestone boulder.....	59.0	61.0
Shale, calcareous, gray, contains mica.....	61.0	65.0

Test Hole #39-40
1N 18E 31baad
Richardson County

Location: SE NE NE NW sec. 31, T. 1 N., R. 18 E., 2,640 feet east and
 360 feet south of northwest corner of section.

Ground elevation: 856.8 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 10.2 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill.....	0.0	5.0
Clay, silty, sandy, brown to gray.....	5.0	33.0
Gravel, gray and brown, fine to coarse.....	33.0	58.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, laminated, calcareous, very hard, dark gray..	58.0	60.5
Limestone.....	60.5	

Test Hole #40-40
1N 18E 31bddd
Richardson County

Location: SE corner NW sec. 31, T. 1 N., R. 18 E., on the west edge
of road, 2,600 feet south of the northwest corner.

Ground elevation: 857.2 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 12.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, brownish gray, with rusty streaks.....	0.0	25.0
Gravel, gray, medium to coarse, contains limestone chips and a seam of clay at base.....	25.0	59.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray.....	59.5	61.5
Limestone or sandstone, dark gray.....	61.5	

Test Hole #41-40
1N 18E 31cddc
Richardson County

Location: SW SE SE SW sec. 31, T. 1 N., R. 18 E., 75 feet north
 and 2,112 feet east of southwest corner.

Ground elevation: 862.4 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 7.58 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, silty, dark brown to gray.....	0.0	19.0
Silt, bluish gray.....	19.0	26.0
Gravel, dark gray, fine to coarse, contains limestone chips in lower part.....	26.0	56.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light gray.....	56.0	58.5
Sandstone, hard, gray.....	58.5	59.0

Test Hole #35-40
1N 18E 32adaa
Richardson County

Location: NE NE SE NE sec. 32 T. 1 N., R. 18 E., 1,584 feet south of
the northeast corner of section.

Ground elevation: 853.4 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 8.6 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark brown to black.....	0.0	5.0
Sand, clayey, brown.....	5.0	8.0
Sand, silty, fine.....	8.0	19.0
Gravel, fine to coarse.....	19.0	53.0
Gravel, very coarse, mostly limestone boulders and water-worn shale.....	53.0	58.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray, contains mica.....	58.0	59.0

Test Hole #36-40
1N 18E 32dada
Richardson County

Location: NE SE NE SE sec. 32, T. 1 N., R. 18 E., on west edge of
road 3,432 feet south of northeast corner of section.

Ground elevation: 852.2 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 9.5 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, dark grayish brown to black.....	0.0	14.0
Clay, silty, sandy, gray.....	14.0	21.0
Silt, light gray.....	21.0	28.0
Sand and gravel, greenish gray, fine.....	28.0	42.0
Gravel, greenish gray, medium to coarse, contains some clay and limestone fragments.....	42.0	55.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark gray to black.....	55.0	59.0
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Test Hole #37-40
1N 18E 33cccc
Richardson County

Location: SW corner sec. 33, T. 1 N., R. 18 E., 100 feet east of
 southwest corner of section.

Ground elevation: 851.4 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 9.1 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, brown to black.....	0.0	10.0
Clay, silty, sandy, gray.....	10.0	30.0
Silt, sandy, gray to black.....	30.0	42.0
Gravel, clayey.....	42.0	45.0
Silt, greenish gray.....	45.0	51.0
Gravel, yellowish gray, coarse, contains limestone..	51.0	56.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, calcareous, gray, contains mica.....	56.0	59.0

Test Hole #34-78
2N 13E 2cbba
Richardson County

Location: NE NW NW SW sec. 2, T. 2 N., R. 13 E., 2,660 feet south of
north section line, and 650 feet east of west section line.
Ground elevation: 1,013.0 feet (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample)..... 0.0 2.0

Permian System - Big Blue Series - Admire Group:

Falls City Formation:

Lehmer Member:

Limestone, dark yellow, pebbly texture, porous..... 2.0 3.0

Reserve Member:

Shale, light olive..... 3.0 7.7

Miles Member:

Limestone, light tannish gray, irregularly
crystalline, contains brachiopods, bryozoans..... 7.7 8.3

Onaga Formation:

Hauxby - Towle Members:

Shale, yellowish olive..... 8.3 10.7
Shale, olive..... 10.7 14.0
Shale, greenish gray, mottled with red..... 14.0 16.0
Shale, greenish gray, light gray, mottled with olive 16.0 18.5
Shale, reddish brown, mottled with olive..... 18.5 20.0
Shale, reddish brown..... 20.0 26.0
Shale, olive gray..... 26.0 26.8

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Wood Siding Formation:

Brownville Member:

Limestone, pale yellow, very finely crystalline,
contains brachiopods, manganese staining..... 26.8 29.0

Pony Creek - Plumb Members:

Shale, olive, mottled with gray..... 29.0 32.0
Shale, medium gray..... 32.0 34.0
Shale, reddish brown, interbedded with greenish gray 34.0 42.0
Shale, olive..... 42.0 43.0
Shale, light gray..... 43.0 45.0
Shale, medium gray..... 45.0 48.0

Nebraska City Member:

Limestone, medium to dark gray, finely crystalline,
impure, contains brachiopods..... 48.0 51.0

Root Formation:**French Creek Member:**

Coal, black.....	51.0	51.5
Shale, light gray.....	51.5	53.2
Coal, black.....	53.2	53.5
Shale, light gray.....	53.5	64.0
Shale, light to medium gray.....	64.0	67.2

Jim Creek Member:

Limestone, medium gray, very finely crystalline, impure, contains brachiopods.....	67.2	68.0
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Friedrich Member:

Shale, light gray.....	68.0	78.0
Shale, light greenish gray.....	78.0	79.0
Shale, reddish brown.....	79.0	81.0
Shale, light gray.....	81.0	83.5

Stotler Formation:**Grandhaven Member:**

Limestone, light gray, very finely crystalline.....	83.5	83.8
Shale, light gray.....	83.8	86.5
Limestone, light gray, very finely crystalline, contains red and green staining.....	86.5	86.8

Dry Member:

Shale, light gray, mottled with red.....	86.8	87.5
Shale, light gray.....	87.5	92.0

Test Hole #35-78
2N 13E 2bddd
Richardson County

Location: SE corner NW sec. 2, T. 2 N., R. 13 E., 2,595 feet south of
north section line, and 2,545 feet east of west section line.
Ground elevation: 999.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Silt, dark brown, clayey, sandy.....	5.0	22.0
Silt, light brown, clayey, sandy.....	22.0	40.0
Clay, light gray.....	40.0	45.0
Sand, fine to very coarse, gravelly, very fine to medium, interbedded with silt, dark gray.....	45.0	55.0
Permian System - Big Blue Series - Admire Group:		
Hamlin Formation:		
Stine Member:		
Shale, olive, mottled with gray.....	55.0	60.0
Shale, light reddish brown, mottled with olive.....	60.0	61.0
Shale, light gray.....	61.0	63.0
Five Point Formation:		
Limestone, white to light gray, irregularly crystalline, contains brachiopods, algal material.	63.0	63.5
West Branch Formation:		
Shale, light greenish gray.....	63.5	64.0
Shale, light gray.....	64.0	67.0
Shale, light greenish gray, limy.....	67.0	70.0
Shale, light greenish gray, interbedded with pale reddish brown.....	70.0	72.0
Shale, light greenish gray, limy.....	72.0	76.0
Shale, medium gray, limy.....	76.0	79.0
Shale, light to medium gray.....	79.0	86.0
Falls City Formation:		
Lehmer Member:		
Limestone, light gray, finely to very finely crystalline, contains some pseudo-oolites.....	86.0	88.2
Shale, light gray.....	88.2	88.4
Limestone, light gray, very finely crystalline.....	88.4	89.1
Reserve Member:		
Shale, medium gray.....	89.1	92.5
Miles Member:		
Shale, light greenish gray, contains hard limy zones	92.5	93.5

Onaga Formation:**Hauxby - Towle Members:**

Shale, light greenish gray.....	93.5	98.0
Shale, light gray, interbedded with red and green...	98.0	103.0
Shale, light gray to light greenish gray.....	103.0	106.0
Shale, brown.....	106.0	112.0
Shale, olive, mottled with gray.....	112.0	113.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:**Wood Siding Formation:****Brownville Member:**

Limestone, pale yellowish gray, finely to very finely crystalline, contains brachiopods, bryozoans.....	113.5	116.0
Shale, olive, mottled with gray.....	116.0	118.2
Limestone, yellow, finely crystalline, sandy, contains bryozoans.....	118.2	118.8

Pony Creek - Plumb Members:

Shale, light gray.....	118.8	121.0
Shale, light greenish gray.....	121.0	122.0
Shale, reddish brown, interbedded with greenish gray	122.0	130.0
Shale, olive.....	130.0	131.0
Shale, light gray.....	131.0	132.0
Shale, light to medium gray.....	132.0	136.4

Nebraska City Member:

Limestone, medium to dark gray, very finely crystalline, impure, contains brachiopods, crinoids, bryozoans.....	136.4	137.3
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Root Formation:**French Creek Member:**

Coal, black.....	137.3	137.5
Shale, light gray.....	137.5	140.0
Coal, black.....	140.0	140.2
Shale, light gray.....	140.2	143.0
Sandstone, light gray, very fine grained, lime cemented, contains mica.....	143.0	144.0
Shale, medium gray, silty.....	144.0	152.0
Shale, medium gray.....	152.0	156.3

Jim Creek Member:

Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	156.3	158.0
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Friedrich Member:

Shale, light greenish gray.....	158.0	163.0
Shale, light gray.....	163.0	167.0

Test Hole #103-40
2N 13E 2ccbb
Richardson County

Location: Center west line SW sec. 2, T. 2 N., R. 13 E., 1,320 feet
north of southwest corner.

Ground elevation: 988.3 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 12.5 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, silty, brown.....	0.0	20.0
Clay, silty, bluish gray.....	20.0	44.0
Gravel, contains water-worn shale, limestone chips..	44.0	46.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, greenish gray.....	46.0	49.0
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Test Hole #108-40
2N 13E 3ccdb
Richardson County

Location: NW SE SW SW sec. 3, T. 2 N., R. 13 E., on north edge of
road 528 feet west of Humboldt and water plant.
Ground elevation: 987.7 feet (a) (Humboldt 7.5 min. quadrangle)
Depth to water: 21.45 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, silty, brown.....	0.5	5.0
Clay, silty, loesslike, buff to reddish brown.....	5.0	19.0
Silt, sandy, bluish gray.....	19.0	36.5
Gravel, gray, coarse, contains large limestone chips below 40.0 ft.....	36.5	41.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark bluish gray.....	41.0	45.0

Test Hole #45-78
2N 13E 3aaba
Richardson County

Location: NE NW NE NE sec. 3, T. 2 N., R. 13 E., 20 feet south of
north section line, and 780 feet west of east section line.
Ground elevation: 1,068.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample)..... 0.0 1.0

Permian System - Big Blue Series - Admire Group:

Hamlin Formation:

Oaks - Stine Member:

Shale, greenish gray.....	1.0	3.0
Shale, reddish brown.....	3.0	4.0
Shale, yellowish brown.....	4.0	10.0
Shale, yellowish brown, mottled with greenish gray..	10.0	12.0
Shale, pale olive.....	12.0	15.0
Shale, light to medium gray.....	15.0	20.0
Shale, medium to dark gray.....	20.0	24.0
Limestone, medium gray, very finely crystalline, contains brachiopods.....	24.0	24.5
Shale, medium gray.....	24.5	26.8
Limestone, light to medium gray, very finely crystalline.....	26.8	29.0
Shale, greenish gray.....	29.0	29.5
Limestone, light gray, very finely crystalline, contains fossil fragments.....	29.5	30.2
Shale, olive.....	30.2	34.0
Shale, medium to dark gray.....	34.0	36.2

Five Point Formation:

Limestone, cream, irregularly crystalline, contains algal material.....	36.2	37.0
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West Branch Formation:

Shale, light gray.....	37.0	41.0
Shale, greenish gray.....	41.0	45.0
Shale, light greenish gray, mottled with red.....	45.0	48.0
Shale, medium gray, interbedded with claystone, tan.	48.0	54.0
Shale, light gray.....	54.0	58.0

Falls City Formation:

Lehmer Member:

Limestone, medium to dark gray, irregularly crystalline, contains fossil fragments.....	58.0	61.0
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Reserve Member:

Shale, medium gray.....	61.0	65.1
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Miles Member:		
Limestone, light to medium gray, irregularly crystalline, impure, contains brachiopods.....	65.1	66.0
Onaga Formation:		
Hauxby - Towle Members:		
Shale, light greenish gray, limy.....	66.0	70.0
Shale, light greenish gray, mottled with pale red...	70.0	75.0
Shale, reddish brown.....	75.0	81.0
Shale, greenish gray, mottled with olive.....	81.0	82.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light greenish gray, very finely crystalline, contains brachiopods, glauconite.....	82.0	84.0
Pony Creek - Plumb Members:		
Shale, olive.....	84.0	87.0
Sandstone, yellowish brown, very fine grained.....	87.0	87.5
Shale, greenish gray, mottled with red.....	87.5	90.0
Shale, reddish brown.....	90.0	99.0
Shale, olive.....	99.0	100.0

Test Hole #107-40
2N 13E 3dddd
Richardson County

Location: SE SE SE SE sec. 3, T. 2 N., R. 13 E., 66 feet west and 102 feet north of the southeast corner of section.

Ground elevation: 987.7 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 25.75 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, sandy, brownish gray.....	0.0	5.0
Clay, gray.....	5.0	20.0
Clay, silty, bluish gray.....	20.0	29.0
Clay, silty, greenish gray.....	29.0	36.0
Sand and gravel, mostly red, fine to coarse.....	36.0	39.0
Gravel, red, coarse.....	39.0	42.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, gray.....	42.0	43.0
Limestone, hard, bluish gray.....	43.0	44.0

Test Hole #46-78
2N 13E 4abbb
Richardson County

Location: NW corner NE sec. 4, T. 2 N., R. 13 E., 15 feet south of
north section line, and 2,565 feet west of east section line.
Ground elevation: 1,005.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	3.0
Clay, reddish brown, silty.....	3.0	9.0
Silt, brownish gray, sandy.....	9.0	10.0
Sand, fine to very coarse, gravelly, very fine to fine.....	10.0	23.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Wamego Member:		
Shale, yellowish brown.....	23.0	24.0
Shale, light gray.....	24.0	32.0
Shale, medium gray.....	32.0	37.0
Shale, greenish gray.....	37.0	37.3
Tarkio Member:		
Limestone, cream, irregularly crystalline, contains fusulinids, <u>Osagia</u> , pseudo-oolites, glauconite....	37.3	41.6
Willard Formation:		
Shale, reddish brown.....	41.6	42.7
Shale, greenish gray, silty.....	42.7	47.0
Shale, medium gray.....	47.0	62.0
Shale, medium gray, interbedded with siltstone, gray	62.0	67.0
Shale, medium gray.....	67.0	77.1
Emporia Formation:		
Elmont Member:		
Limestone, light to medium bluish gray, finely to very finely crystalline, contains brachiopods and crinoids.....	77.1	78.0
Shale, light gray.....	78.0	79.0
Limestone, light tannish gray, very finely crystalline to dense.....	79.0	79.5
Shale, light greenish gray.....	79.5	81.0
Limestone, light greenish gray to tannish gray, very finely crystalline.....	81.0	81.6
Harveyville Member:		
Shale, greenish gray.....	81.6	84.4
Shale, medium gray.....	84.4	84.8

Reading Member:

Limestone, bluish gray, fine to very finely crystalline, contains brachiopods.....	84.8	86.7
Shale, medium gray.....	86.7	89.0
Limestone, bluish gray, irregularly crystalline, contains brachiopods and crinoids.....	89.0	90.2

Auburn Formation:

Shale, greenish gray to light gray.....	90.2	92.0
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Test Hole #64-78
2N 13E 4ccdd
Richardson County

Location: SE corner SW SW sec. 4, T. 2 N., R. 13 E., 22 feet north of
 south section line, and 1,285 feet east of west section line.
 Ground elevation: 985.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Silt, light brown, clayey.....	5.0	17.0
Silt, gray to greenish gray.....	17.0	28.0
Sand, fine to very coarse, gravelly, very fine to medium.....	28.0	32.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Willard Formation:		
Shale, medium gray, silty.....	32.0	59.0
Emporia Formation:		
Elmont Member:		
Limestone, light brownish gray, very finely crystalline, contains brachiopods.....	59.0	61.5
Shale, medium gray.....	61.5	62.7
Limestone, light gray, finely to very finely crystalline, contains calcite crystals.....	62.7	64.0
Shale, light greenish gray.....	64.0	64.5
Limestone, light greenish gray, very finely crystalline.....	64.5	65.0
Harveyville Member:		
Shale, medium gray.....	65.0	68.2
Reading Member:		
Limestone, medium gray to tannish gray, finely to very finely crystalline, contains brachiopods, crinoids, algal material, pyrite, interbedded with shale, gray.....	68.2	73.5
Auburn Formation:		
Shale, medium gray.....	73.5	76.0
Shale, reddish brown.....	76.0	81.0
Shale, olive to greenish gray.....	81.0	83.0
Shale, medium gray.....	83.0	96.0
Wakarusa Formation:		
Limestone, light to medium bluish gray, finely crystalline, contains brachiopods, crinoids, and fusulinids.....	96.0	100.0
Soldier Creek Formation:		
Shale, medium gray to dark greenish gray.....	100.0	107.0

Test Hole #111-40
2N 13E 8aaaa
Richardson County

Location: NE NE NE NE sec. 8, T. 2 N., R. 13 E., on south edge of
road, 300 feet west of the northeast corner.
Ground elevation: 986.0 feet (t) (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, brownish gray.....	0.0	14.0
Clay, silty, brownish gray.....	14.0	19.0
Clay, silty, sandy, bluish gray.....	19.0	40.0
Gravel, gray, fine to coarse, contains limestone and shale fragments below 44.0 ft.....	40.0	45.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark gray to black.....	45.5	47.0
Limestone, hard, dark gray.....	47.0	48.0

Test Hole #109-40
2N 13E 9back
Richardson County

Location: NW SW NE NW sec. 9, T. 2 N., R. 13 E., on east edge of road, 180 feet north of railroad, 1,320 feet east and 792 feet south of northwest corner of section.

Ground elevation: 290.4 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 23.55 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, brownish gray.....	0.0	5.0
Clay, buff.....	5.0	13.0
Clay, sandy, reddish brown.....	13.0	19.0
Gravel, mostly red, fine to coarse.....	19.0	26.0
Lost circulation.....	26.0	

Test Hole #110-40
2N 13E 9bacc
Richardson County

Location: Center NW sec. 9, T. 2 N., R. 13 E., on east edge of road,
 1,320 feet east and 1,320 feet south of the northwest
 corner of section.

Ground elevation: 990.0 feet (t) (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, gray.....	0.0	10.0
Clay, brownish gray.....	10.0	14.0
Clay, silty, gray to buff.....	14.0	19.0
Clay, silty, sandy, gray.....	19.0	24.0
Gravel, greenish gray.....	24.0	25.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray.....	25.0	28.5
Limestone, hard.....	28.5	28.9

Test Hole #44-78
2N 13E 10accc
Richardson County

Location: SW corner NE sec. 10, T. 2 N., R. 13 E., 2,440 feet south of north section line, and 2,665 feet east of west section line.

Ground elevation: 980.0 ft (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	10.0
Silt, dark brown, clayey.....	10.0	16.0
Silt, light brown, clayey.....	16.0	21.0
Silt, dark gray to dark brown.....	21.0	31.0
Silt, dark greenish gray.....	31.0	36.0
Sand, medium to coarse, gravelly, very fine to medium.....	36.0	40.0
Permian System - Big Blue Series - Council Grove Group:		
Foraker Formation:		
Hughes Creek Member:		
Shale, black.....	40.0	41.0
Shale, medium gray.....	41.0	42.7
Limestone, light to medium gray, very finely crystalline, contains brachiopods, fusulinids, pelecypods.....	42.7	44.0
Shale, medium gray, interbedded with sandstone, gray, very fine grained.....	44.0	54.0
Shale, dark gray.....	54.0	59.0
Shale, medium to dark gray.....	59.0	66.0
Americus Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids, pelecypods.....	66.0	68.3
Shale, black.....	68.3	69.0
Shale, medium gray.....	69.0	72.8
Admire Group:		
Hamlin Formation:		
Oaks - Stine Members:		
Limestone, medium to dark gray, finely crystalline, interbedded with shale, greenish gray.....	72.8	73.1
Shale, greenish gray, limy.....	73.1	77.0
Shale, greenish gray to medium gray.....	77.0	80.0
Shale, light gray, interbedded with pale red, contains gypsum.....	80.0	85.0
Shale, light greenish gray, interbedded with claystone, tan.....	85.0	88.0

Shale, light to medium gray.....	88.0	92.0
Shale, medium to dark gray.....	92.0	96.0
Limestone, medium gray, very finely crystalline, contains fossil fragments, interbedded with shale, greenish gray.....	96.0	100.5
Limestone, light tannish gray, very finely crystalline.....	100.5	101.0
Shale, medium to dark gray.....	101.0	105.0
Shale, olive.....	105.0	107.0
Shale, medium to dark gray.....	107.0	109.0
Five Point Formation:		
Limestone, cream, irregularly crystalline, contains algal material.....	109.0	109.3
West Branch Formation:		
Shale, medium gray.....	109.3	112.5
Shale, greenish gray.....	112.5	113.0
Shale, medium to dark gray, interbedded with pale red.....	113.0	117.0
Shale, medium gray, limy.....	117.0	122.0
Shale, medium gray.....	122.0	128.7
Falls City Formation:		
Lehmer Member:		
Limestone, gray, very finely crystalline, porous, contains gypsum.....	128.7	131.0
Reserve Member:		
Shale, medium gray.....	131.0	133.3
Miles Member:		
Limestone, light gray, very finely crystalline, interbedded with shale, greenish gray.....	133.3	134.5
Onaga Formation:		
Shale, greenish gray, limy.....	134.5	139.0
Shale, greenish gray, mottled with pale red.....	139.0	141.0
Shale, light greenish gray.....	141.0	144.0
Shale, reddish brown.....	144.0	149.6
Shale, light gray, mottled with olive.....	149.6	152.0

Test Hole #102-40
2N 13E 10baaa
Richardson County

Location: NE NE NE NW sec. 10, T. 2 N., R. 13 E., 300 feet south and
 300 feet west of the northeast corner of the northwest
 quarter of section.

Ground elevation: 980.3 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 6.2 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Clay, sandy, brown.....	0.0	12.0
Clay, silty, buff to grayish buff.....	12.0	20.0
Silt, dark gray.....	20.0	29.0
Clay, silty, sandy, gray.....	29.0	36.5
Sandstone, rusty, contains iron concretions, limestone, and some fine gravel.....	36.5	39.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, gray to red.....	39.0	45.0
Shale, dark gray, contains mica.....	45.0	49.0

Test Hole #104-40
2N 13E 10bdaa
Richardson County

Location: NE NE SE NW sec. 10, T. 2 N., R. 13 E., on west edge of road, 1,425 feet south of the northeast corner of the northwest quarter of section.

Ground elevation: 978.4 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 19.95 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Clay, dark gray to brownish gray.....	0.0	9.0
Clay, silty, light brownish gray.....	9.0	20.5
Clay, silty, dark gray.....	20.5	33.0
Clay, light bluish gray.....	33.0	38.5
Gravel, fine to coarse, contains water-worn shale and limestone chips.....	38.5	41.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone and shale, calcareous, thin interbeds.....	41.0	43.0
Limestone.....	43.0	43.5
Shale, light olive gray.....	43.5	47.0
Shale, dark gray, with some dark red staining.....	47.0	49.0

Test Hole #105-40**1N 13E 10bdda****Richardson County**

Location: NE SE SE NW sec. 10, T. 2 N., R. 13 E., on west edge of road, 2,270 feet south of northeast corner of the northwest quarter of section.

Ground elevation: 978.1 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 14.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, brownish gray.....	0.0	7.0
Clay, slightly brownish gray.....	7.0	13.0
Clay, buff gray.....	13.0	19.0
Clay, silty, bluish gray.....	19.0	25.0
Clay, silty, greenish gray.....	25.0	29.0
Sand, silty, clayey, olive gray.....	29.0	35.0
Gravel, coarse.....	35.0	37.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, bluish gray.....	37.0	39.0

Test Hole #106-40
2N 13E 10caad
Richardson County

Location: SE NE NE SW sec. 10, T. 2 N., R. 13 E., 2,640 feet east and
 3,273 feet south of northwest corner of section.
 Ground elevation: 979.8 feet (a) (Humboldt 7.5 min. quadrangle)
 Depth to water: 18.7 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Sand, silty, brown.....	0.0	20.0
Gravel, fine.....	20.0	23.0
Clay, silty, sandy, bluish gray.....	23.0	42.0
Sand and gravel, fine, reddish brown.....	42.0	48.0
Gravel, coarse, contains water-worn limestone and shale.....	48.0	51.0
Gravel, contains limestone boulders and chips.....	51.0	53.5

Permian System - Big Blue Series - Council Grove Group:

Limestone or limestone boulder.....	53.5	55.0
Shale, calcareous, gray.....	55.0	57.0

Test Hole #30-B-67 (2)
2N 13E 12aaaa
Richardson County

Location: NE NE NE NE sec. 12, T. 2 N., R. 13 E., 198 feet south of
north section line, and 7.7 feet west of east section line.
Ground elevation: 1,109.0 feet (Humboldt 7.5 min. quadrangle)
Depth to water: 24.30 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Top soil.....	0.0	1.0
Clay, very silty, moderately sandy, very fine to fine, yellowish brown.....	1.0	3.0
Clay, slightly silty, moderately sandy, yellowish brown.....	3.0	10.0
Clay, moderately to very silty, very sandy, very fine to fine, yellowish brown.....	10.0	13.0
Silt, very clayey, very sandy, very fine to medium, green, mottled with brown.....	13.0	13.7
Permian System - Big Blue Series - Council Grove Group:		
Stearns Formation:		
Shale, pale olive.....	13.7	13.9
Shale, light gray.....	13.9	14.3
Shale, light greenish gray.....	14.3	14.4
Shale, light greenish gray, with strings of dark reddish brown.....	14.4	15.2
Shale, light greenish gray, with limestone, pale olive.....	15.2	15.3
Shale, medium greenish gray, hard.....	15.3	15.8
Shale, pale reddish gray, mottled with greenish gray	15.8	16.0
Shale, light greenish gray, mottled with red.....	16.0	16.7
Shale, reddish gray.....	16.7	17.0
Shale, reddish gray, mottled with light greenish gray.....	17.0	17.2
Shale, dark reddish brown.....	17.2	20.0
Shale, light greenish gray.....	20.0	21.0
Beattie Formation:		
Morrill Member:		
Limestone, pale yellow, very finely crystalline to dense.....	21.0	22.0
Shale, pale yellow, with some limestone, very finely crystalline to dense.....	22.0	23.4
Limestone, light gray, very finely crystalline, interbedded with shale, pale yellow.....	23.4	24.2
Limestone, brownish yellow, very fine to finely crystalline.....	24.2	24.7

Limestone, pale yellow, very finely crystalline, contains fossils.....	24.7	26.5
Limestone, white, chalky.....	26.5	27.5
Florena Member:		
Shale, very pale yellow.....	27.5	29.7
Cottonwood Member:		
Limestone, pale yellow, very finely crystalline.....	29.7	30.0
Limestone, pale yellow, very finely crystalline, contains abundant fusulinids.....	30.0	32.0
Limestone, light to medium gray, very finely crystalline.....	32.0	35.8
Limestone, pale yellow, very finely crystalline, contains some white gypsum.....	35.8	37.0

Test Hole #114-40
2N 13E 12cdad
Richardson County

Location: SE NE SE SW sec. 12, T. 2 N., R. 13 E., on west edge of road, approximately 2,600 feet east and 686 feet north of the southwest corner of the section.

Ground elevation: 975.8 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 8.18 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill.....	0.0	5.0
Clay, dark gray to black.....	5.0	10.0
Clay, light gray, contains small limestone fragments	10.0	19.0
Clay, dark gray to black.....	19.0	28.0
Clay, silty, sandy, dark gray.....	28.0	43.5
Gravel, fine to coarse, contains shell fragments		
below 55.0 ft.....	43.5	57.0

Permian System - Big Blue Series - Council Grove Group:

Limestone, hard, dark gray, contains calcite		
concretions in upper part.....	57.0	58.0
Shale, light gray, contains shell fragments.....	58.0	61.0

Test Hole #113-40
2N 13E 13bada
Richardson County

Location: NE SE NE NW sec. 13, T. 2 N., R. 13 E., on west edge of road, 792 feet south and 2,640 feet east of the northwest corner of the section.

Ground elevation: 974.4 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill.....	0.0	4.0
Sand, clayey, brownish gray.....	4.0	24.0
Clay, gray.....	24.0	28.0
Clay, silty, sandy.....	28.0	34.0
Gravel, light gray, grayish white, fine to coarse...	34.0	41.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, chalklike, yellow.....	41.5	44.5
Limestone, chalky, brownish yellow, contains calcite concretions, pinkish gray and white.....	44.5	46.0
Limestone, shaly, very hard at 47.0 ft.....	46.0	47.0

Test Hole #115-40
2N 13E 13bdda
Richardson County

Location: NE SE SE NW sec. 13, T. 2 N., R. 13 E., on west edge of road, 2,640 feet east and 2,112 feet south of the northwest corner of the section.

Ground elevation: 983.7 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	4.0
Clay, buff.....	4.0	7.0
Clay, reddish brown.....	7.0	22.0
Sand, clayey, gray.....	22.0	24.0
Gravel, red, fine to coarse, contains limestone fragments.....	24.0	40.0
Sand and gravel, fine.....	40.0	44.0
Gravel, fine to coarse, contains limestone boulders.	44.0	48.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, yellow, or limestone, weathered.....	48.0	50.5
Limestone, hard, brown.....	50.5	51.0

Test Hole #31-78
2N 13E 15CDDD
Richardson County

Location: SE corner SW sec. 15, T. 2 N., R. 13 E., 60 feet north of south section line, and 2,630 feet east of west section line.

Ground elevation: 1,120.0 ft (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	1.0
Clay, light brown, silty.....	1.0	3.0
Clay, dark brown, silty.....	3.0	9.5
Silt, light brown, sandy.....	9.5	12.5

Permian System - Big Blue Series - Council Grove Group:

Beattie Formation:

Cottonwood Member:

Limestone, pale yellow, finely to very finely crystalline, contains fusulinids.....	12.5	17.0
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Eskridge Formation:

Shale, light olive.....	17.0	22.0
Shale, reddish brown.....	22.0	26.2
Shale, light olive.....	26.2	29.5
Limestone, light tannish gray, very finely crystalline to dense.....	29.5	30.4
Shale, olive.....	30.4	32.0

Test Hole #33-78
2N 13E 16aaba
Richardson County

Location: NE NW NE NE sec. 16, T. 2 N., R. 13 E., 15 feet south of
north section line, and 850 feet west of east section
line.

Ground elevation: 1,004.0 ft (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	5.0
Clay, reddish brown, silty.....	5.0	15.0
Clay, reddish brown, silty, sandy.....	15.0	20.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Root Formation:

French Creek Member:

Shale, medium to dark gray.....	20.0	25.5
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Jim Creek Member:

Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	25.5	26.2
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Friedrich Member:

Shale, light gray.....	26.2	38.0
Shale, light gray, mottled with red.....	38.0	40.0
Shale, light gray.....	40.0	46.0
Shale, reddish gray.....	46.0	46.5
Limestone, light gray, stained with pale red, very finely crystalline.....	46.5	46.7
Shale, maroon, interbedded with gray.....	46.7	47.2
Shale, light greenish gray.....	47.2	48.7
Shale, reddish brown.....	48.7	49.5

Stotler Formation:

Grandhaven Member:

Limestone, reddish brown, dense, interbedded with shale, reddish brown.....	49.5	51.0
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Dry Member:

Shale, reddish brown.....	51.0	56.0
Shale, olive.....	56.0	57.0
Shale, light gray.....	57.0	62.0
Shale, light to medium gray.....	62.0	67.5

Dover Member:

Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	67.5	68.4
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Pillsbury Formation:

Shale, light gray.....	68.4	70.0
Shale, light greenish gray.....	70.0	70.5

Shale, reddish brown.....	70.5	75.5
Shale, olive.....	75.5	76.5
Shale, light to medium gray.....	76.5	85.1
Zeandale Formation:		
Maple Hill Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	85.1	85.4
Shale, dark gray.....	85.4	86.5
Limestone, bluish gray to medium gray, fine to very finely crystalline, contains brachiopods, crinoids, fusulinids.....	86.5	88.1
Wamego Member:		
Shale, light gray.....	88.1	100.0
Tarkio Member:		
Limestone, cream, irregularly crystalline, contains fusulinids, <u>Osagia</u>	100.0	104.5
Willard Formation:		
Shale, light gray.....	104.5	107.0

Test Hole #27-78
2N 13E 19bbbb
Richardson County

Location: NW corner sec. 19, T. 2 N., R. 13 E., 35 feet south of
north section line, and 12 feet east of west section
line.

Ground elevation: 1,047.0 ft

(Table Rock 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample)..... 0.0 4.0

Clay, brown, sandy..... 4.0 11.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Scranton Formation:

Silver Lake - Cedarvale Members:

Shale, yellowish olive..... 11.0 17.0

Shale, medium gray, mottled with olive..... 17.0 19.0

Shale, light gray..... 19.0 21.0

Shale, light greenish gray..... 21.0 23.0

Shale, reddish brown..... 23.0 26.4

Happy Hollow Member:

Limestone, light greenish gray, very finely
crystalline, stained red and green..... 26.4 27.6

Scranton - Severy Formations:

Shale, reddish brown..... 27.6 28.0

Shale, yellowish olive..... 28.0 30.0

Shale, red, mottled with olive..... 30.0 31.0

Shale, light gray..... 31.0 34.0

Shale, medium gray..... 34.0 39.5

Limestone, dark bluish gray, irregularly
crystalline, contains brachiopods, crinoids, and
fusulinids..... 39.5 41.4

Shale, light gray..... 41.4 53.0

Shale, light gray, interbedded with sandstone,
gray, very fine grained..... 53.0 57.2

Sandstone, light gray, very fine to fine grained,
limy, interbedded with shale, light gray, silty.. 57.2 59.2

Shale, light gray, silty..... 59.2 77.0

Shale, light gray, silty, sandy..... 77.0 92.0

Shale, light to medium gray, silty, sandy..... 92.0 104.5

Shale, light gray, limy, contains black,
carbonaceous material..... 104.5 106.5

Shale, light greenish gray, silty..... 106.5 132.0

Shale, light to medium gray, interbedded with
sandstone, gray, very fine, grained..... 132.0 152.0

Shawnee Group:**Topeka Formation:****Coal Creek Member:**

Limestone, medium to dark gray, irregularly crystalline, contains brachiopods and fusulinids.	152.0	156.0
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Holt Member:

Shale, black.....	156.0	158.8
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DuBois Member:

Limestone, bluish gray, fine to very finely crystalline, contains brachiopods, crinoids.....	158.8	161.2
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Turner Creek Member:

Shale, light greenish gray.....	161.2	164.6
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Sheldon - Curzon Members:

Limestone, cream, irregularly crystalline, finely crystalline, interbedded with shale, greenish gray, contains brachiopods, algal material.....	164.6	171.0
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Limestone, light to medium gray, irregularly crystalline, interbedded with shale, gray, contains brachiopods, crinoids, fusulinids.....	171.0	177.5
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Test Hole #28-78
2N 13E 21bbbb
Richardson County

Location: NW corner sec. 21, T. 2 N., R. 13 E., 65 feet south of
north section line, and 15 feet east of west section line.
Ground elevation: 1,133.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Clay, yellowish brown, silty, sandy.....	2.0	12.0
Sand, fine to very coarse, gravelly, fine to coarse, contains reworked limestone.....	12.0	19.5
Clay, brownish gray.....	19.5	32.0
Clay, medium gray, silty.....	32.0	47.0
Silt, medium gray, clayey.....	47.0	62.0
Silt, medium to dark gray, clayey, limy.....	62.0	67.0
Sand, medium to very coarse, gravelly, fine to very coarse, contains reworked limestone.....	67.0	79.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Auburn Formation:		
Shale, olive.....	79.0	81.0
Shale, medium to dark gray, mottled with olive.....	81.0	86.0
Shale, medium to dark gray.....	86.0	95.3
Wakarusa Formation:		
Limestone, gray, very finely crystalline, contains brachiopods, crinoids, fusulinids.....	95.3	98.4
Soldier Creek Formation:		
Shale, medium gray.....	98.4	106.0
Shale, medium gray, interbedded with brown.....	106.0	108.0
Burlingame Formation:		
South Fork Member:		
Limestone, cream, irregularly crystalline, contains algal material.....	108.0	110.0
Winnebago Member:		
Shale, light greenish gray.....	110.0	112.0
Shale, medium to dark gray.....	112.0	115.0
Taylor Branch Member:		
Limestone, gray, very finely crystalline.....	115.0	115.5
Shale, medium gray.....	115.5	116.5
Limestone, gray, very finely crystalline, contains brachiopods.....	116.5	117.5
Shale, medium to dark gray.....	117.5	120.7
Limestone, bluish gray, irregularly crystalline, contains brachiopods, algal material.....	120.7	121.5

Shale, medium to dark gray, sandy.....	121.5	122.8
Limestone, light greenish gray, very finely crystalline.....	122.8	123.5
Shale, medium to dark gray.....	123.5	125.5
Limestone, light brownish gray, very finely crystalline, contains red staining.....	125.5	127.0
Scranton Formation:		
Silver Lake - Cedarvale Members:		
Shale, light to medium gray.....	127.0	132.0
Shale, medium to dark gray, silty.....	132.0	142.0
Shale, light gray.....	142.0	149.0
Shale, light greenish gray.....	149.0	151.0
Shale, reddish brown.....	151.0	157.6
Happy Hollow Member:		
Limestone, light greenish gray, very finely crystalline, stained red and yellow, interbedded with shale, reddish yellow and green.....	157.6	161.0
White Cloud Member:		
Shale, medium gray.....	161.0	169.5
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	169.5	170.6
Shale, light to medium gray.....	170.6	181.0
Shale, medium gray, very fine grained, thin.....	181.0	191.0
Shale, light to medium gray, silty, sandy.....	191.0	212.0

Test Hole #29-78
2N 13E 21baaa
Richardson County

Location: NE corner NW sec. 21, T. 2 N., R. 13 E., 25 feet south of
north section line, and 2,639 feet east of west section
line.

Ground elevation: 1,125.0 ft (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	4.0
Sand, brown, very fine to medium grained, silty.....	4.0	9.0
Sand, fine to very coarse, gravelly, fine to medium.	9.0	26.0
Silt, brownish olive, sandy.....	26.0	34.0
Silt, light gray, sandy.....	34.0	74.0
Silt, light bluish gray.....	74.0	84.0
Silt, light bluish gray, interbedded with brownish gray.....	84.0	90.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Willard Formation:		
Shale, light to medium gray.....	90.0	99.2
Emporia Formation:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	99.2	101.6
Shale, light gray.....	101.6	103.0
Limestone, light gray to cream, irregularly crystalline, contains algal material.....	103.0	105.5
Harveyville Member:		
Shale, light to medium gray.....	105.5	109.2
Reading Member:		
Limestone, medium gray, finely to very finely crystalline, contains brachiopods, crinoids.....	109.2	112.5
Shale, medium gray.....	112.5	113.0
Limestone, light to medium gray, finely to very finely crystalline, contains brachiopods, crinoids	113.0	114.6
Willard Formation:		
Shale, medium gray.....	114.6	117.4
Shale, light greenish gray.....	117.4	117.6
Shale, reddish brown.....	117.6	122.0
Shale, olive, mottled with red.....	122.0	125.0
Shale, medium to dark gray.....	125.0	138.5
Wakarusa Formation:		
Limestone, bluish gray, finely to very finely crystalline, contains brachiopods, crinoids, and fusulinids.....	138.5	142.0

Soldier Creek Formation:		
Shale, medium gray.....	142.0	147.0
Shale, light to medium gray.....	147.0	150.0
Limestone, brownish gray, very finely crystalline to dense.....	150.0	151.0
Shale, reddish brown, mottled with olive.....	151.0	152.0
Burlingame Formation:		
South Fork Member:		
Limestone, white to light gray, finely to very finely crystalline, contains algal material.....	152.0	154.0
Winnebago Member:		
Shale, light greenish gray.....	154.0	158.0
Shale, medium gray.....	158.0	160.5
Taylor Branch Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, pyrite.....	160.5	162.2
Shale, medium to dark gray.....	162.2	164.8
Limestone, light gray, very finely crystalline, contains algal material.....	164.8	167.4
Shale, medium gray.....	167.4	169.5
Limestone, light tannish gray, very finely crystalline to dense.....	169.5	170.5
Scranton Formation:		
Silver Lake - Cedarvale Members:		
Shale, medium gray.....	170.5	189.1
Shale, medium gray, interbedded with siltstone, brown.....	189.1	195.0
Shale, light greenish gray.....	195.0	197.0
Shale, reddish brown.....	197.0	202.2
Happy Hollow Member:		
Limestone, light greenish gray, very finely crystalline to dense, stained red, interbedded with shale, reddish gray.....	202.2	203.0
White Cloud Member:		
Shale, light olive gray.....	203.0	206.0
Shale, light to medium gray.....	206.0	214.2
Limestone, bluish gray, pebbly texture, contains brachiopods, crinoids, fusulinids, pyrite.....	214.2	215.0
Shale, light to medium gray.....	215.0	229.5
Shale, light gray, limy.....	229.5	231.0
Shale, light gray, silty.....	231.0	262.0
Shale, light to medium gray, silty.....	262.0	283.2
Howard Formation:		
Limestone, dark bluish gray, irregular crystalline, contains brachiopods, crinoids, fusulinids, pyrite	283.2	285.6

Severy Formation:

Coal, black.....	285.6	286.2
Shale, light to medium gray, silty.....	286.2	292.0
Shale, light gray, silty, interbedded with sandstone, gray, very fine grained, thin.....	292.0	302.0

Test Hole #32-78
2N 13E 21aaaa
Richardson County

Location: NE corner sec. 21, T. 2 N., R. 13 E., 91 feet south of north section line, and 49 feet west of east section line.

Ground elevation: 1,115.0 ft (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Clay, reddish brown, silty.....	2.0	6.5
Clay, light brown, silty.....	6.5	14.0
Clay, brownish gray.....	14.0	22.8
Permian System - Big Blue Series - Admire Group:		
Five Point Formation:		
Limestone, cream, irregularly crystalline, contains algal material.....	22.8	23.4
West Branch Formation:		
Shale, light olive.....	23.4	26.7
Shale, dark greenish gray, interbedded with siltstone, dark brown.....	26.7	28.0
Shale, light olive gray.....	28.0	31.0
Shale, yellow.....	31.0	32.0
Shale, light olive gray to greenish gray.....	32.0	36.0
Shale, medium to dark gray.....	36.0	45.0
Shale, olive, mottled with yellow.....	45.0	45.3
Falls City Formation:		
Lehmer Member:		
Limestone, yellow, very finely crystalline, contains pseudo-oolites.....	45.3	46.2
Reserve Member:		
Shale, medium gray.....	46.2	51.0
Miles Member:		
Limestone, bluish gray, pebbly texture, contains black inclusions.....	51.0	51.4
Onaga Formation:		
Hauxby - Towle Members:		
Shale, light greenish gray.....	51.4	55.4
Shale, greenish gray, interbedded with reddish gray.....	55.4	63.5
Shale, reddish brown.....	63.5	68.5
Shale, greenish gray.....	68.5	69.0
Shale, olive, mottled with gray.....	69.0	70.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Wood Siding Formation:

Brownville Member:

Limestone, light gray, very finely crystalline, contains brachiopods, glauconite.....	70.0	72.1
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Pony Creek - Plumb Members:

Shale, medium to light gray.....	72.1	75.0
Shale, reddish brown, mottled with olive.....	75.0	75.4
Shale, olive, mottled with gray.....	75.4	76.0
Shale, medium gray.....	76.0	76.5
Shale, reddish brown, interbedded with gray.....	76.5	87.0
Shale, light greenish gray, mottled with olive.....	87.0	88.0
Shale, medium gray.....	88.0	90.5

Nebraska City Member:

Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	90.5	92.5
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Root Formation:

French Creek Member:

Coal, black.....	92.5	93.0
Shale, light greenish gray.....	93.0	98.0
Coal, black.....	98.0	98.1
Shale, medium to light gray.....	98.1	100.0

Test Hole #31-B-67
2N 13E 24baad
Richardson County

Location: SE NE NE NW sec. 24, T. 2 N., R. 13 E., 404 feet south of north section line, and 2,630 feet east of west section line.

Ground elevation: 1,086.0 feet (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill (no sample).....	0.0	1.5
Clay, moderately to very silty, granular, light yellowish brown.....	1.5	5.2
Silt, slightly to very clayey, slightly to moderately sandy, very fine to coarse, gravelly, reddish brown.....	5.2	11.3
Sand and gravel, 60% very fine to coarse sand, fine to coarse gravel, 25%, reddish brown.....	11.3	15.0
Sand, fine to coarse, slightly gravelly.....	15.0	22.5
Clay, moderately silty, slightly sandy, very fine to medium, brown.....	22.5	23.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, pale yellow, very finely crystalline, vuggy, shale, pale yellow.....	23.0	23.4
Limestone, pale yellow, manganese stain, shale, pale yellow.....	23.4	23.6
Limestone and shale, pale yellow.....	23.6	24.2
Limestone, pale yellow.....	24.2	25.0

Test Hole #97-40
2N 13E 25cccc
Richardson County

Location: SW SW SW SW sec. 25, T. 2 N., R. 13 E., on north edge of
road, 130 feet east of the southwest corner of section.
Ground elevation: 960.6 feet (a) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 22.95 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	4.0
Clay, gray.....	4.0	10.0
Clay, silty, greenish gray, with rusty streaks.....	10.0	15.0
Clay, silty, dark gray.....	15.0	19.0
Sand, silty, light gray, with rusty streaks.....	19.0	24.0
Gravel, yellow, red, gray, fine to coarse, contains boulders below 32.5 ft.....	24.0	36.0
Permian System - Big Blue Series - Admire Group:		
Shale, calcareous, light greenish and bluish gray...	36.0	38.5
Limestone, light gray.....	38.5	39.5
Limestone, interbedded with shale.....	39.5	41.5

Test Hole #129-40
2N 13E 26cbad
Richardson County

Location: SE NE NW SW sec. 26, T. 2 N., R. 13 E., near the center of the east half of the northwest quarter of the southwest quarter of the section.

Ground elevation: 970.0 feet (t) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clay, dark brown.....	0.0	5.0
Clay, dark brownish gray, becoming lighter with depth.....	5.0	17.0
Clay, silty, dark greenish gray, contains pebbles below 25.0 ft.....	17.0	27.0
Clay, contains limestone pebbles and scattered some scattered gravel.....	27.0	29.0
Clay, contains shale pebbles and limestone chips....	29.0	33.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, dark bluish gray.....	33.0	33.5
Limestone, hard.....	33.5	

Test Hole #130-40
2N 13E 26cbad
Richardson County

Location: SE NE NW SW sec. 26, T. 2 N., R. 13 E., 50 feet southwest
of test hole 129-40.
Ground elevation: 975.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown.....	0.0	5.0
Clay, brown to buff.....	5.0	17.0
Clay, silty, dark gray.....	17.0	24.5
Clay, silty, greenish gray, contains scattered pebbles.....	24.5	28.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, contains chips and pebbles, clayey.....	28.0	30.0
Limestone.....	30.0	

Test Hole #131-40
2N 13E 26cbad
Richardson County

Location: SE NE NW SW sec. 26 T. 2 N., R. 13 E., 75 feet southwest of
test hole 129-40.
Ground elevation: 980.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:	0.0	6.0
Soil, clayey, silty, dark brown.....	6.0	21.0
Clay, silty, gray, contains streaks of iron stain..	21.0	26.0
Clay, silty, gray, with a green tint.....		
Gravel, clayey, contains limestone chips and pebbles.....	26.0	29.5
Permian System - Big Blue Series - Council Grove Group:		
Shale, light green, with a purple tint, light grayish green with some yellow below 31.0 ft.....	29.5	32.0

Test Hole #138-40
2N 13E 26cbbb
Richardson County

Location: NW NW NW SW sec. 26, T. 2 N., R. 13 E., 100 feet south and
 35 feet east of northwest corner of southwest quarter of section.
 Ground elevation: 1,005.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
 Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown.....	0.0	5.0
Clay, silty, very fine sand, contains rusty streaks.	5.0	17.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, dark gray to black.....	17.0	20.5
Limestone, hard, bluish gray.....	20.5	21.3
Shale, dark to light gray.....	21.3	28.3
Limestone, hard, dark gray.....	28.3	28.7

Test Hole #132-40
2N 13E 26cbdb
Richardson County

Location: NW SE NW SW sec. 26, T. 2 N., R. 13 E., 125 feet southwest
of test hole 129-40.
Ground elevation: 980.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 6.0 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, dark brown.....	0.0	5.0
Clay, brownish gray.....	5.0	15.0
Clay, silty, gray, with slight greenish tint.....	15.0	23.0
Clay, olive brown, contains a few limestone pebbles and gravel.....	23.0	29.0

Permian System - Big Blue Series - Council Grove Group:

Limestone chips, shale pebbles, slightly gravelly...	29.0	30.5
Shale, dark gray.....	30.5	31.5

Test Hole #133-40
2N 13E 26cbdb
Richardson County

Location: NW SE NW SW sec. 26, T. 2 N., R. 13 E., 150 feet southwest
of test hole 129-40.

Ground elevation: 985.0 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, dark brown.....	0.0	6.0
Clay, gray, with rusty streaks.....	6.0	16.0
Clay, dark greenish gray.....	16.0	23.5
Clay, sandy, brown, contains limestone chips and slightly gravelly.....	23.5	28.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone pebbles, water-worn shale, slightly gravelly.....	28.0	29.5
Shale, dark gray to black.....	29.5	30.5

Test Hole #134-40
2N 13E 26cbdb
Richardson County

Location: NW SE NW SW sec. 26, T. 2 N., R 13 E., 200 feet southwest
of test hole 129-40.
Ground elevation: 990.0 feet (t) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:	0.0	4.0
Soil, clay, dark brown.....	4.0	9.0
Clay, brownish gray.....	9.0	15.0
Clay, buff to gray.....		
Permian System - Big Blue Series - Council Grove Group:	15.0	17.5
Limestone chips, shale, slightly clayey.....	17.5	19.0
Shale, light greenish gray.....	19.0	21.5
Shale, dark gray to black.....		

Test Hole #25-78
2N 13E 26ccbb
Richardson County

Location: NW NW SW SW sec. 26, T. 2 N., R. 13 E., 1,056 feet north
of south section line, and 20 feet east of west section line.
Ground elevation: 973.0 ft (Humboldt SW 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	4.0
Clay, brown, sandy.....	4.0	7.0
Sand, very fine to very coarse.....	7.0	12.0
Sand, very fine to very coarse, gravelly, very fine to medium.....	12.0	17.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Stotler Formation:		
Dry Member:		
Shale, reddish brown.....	17.0	18.0
Shale, reddish brown, mottled with olive.....	18.0	19.0
Shale, medium gray.....	19.0	34.3
Dover Member:		
Limestone, medium to dark gray, irregularly crystalline, contains brachiopods, crinoids.....	34.3	35.0
Pillsbury Formation:		
Shale, olive gray.....	35.0	37.0
Shale, light greenish gray.....	37.0	39.0
Shale, reddish brown.....	39.0	43.0
Shale, reddish brown, mottled with green, gray, olive.....	43.0	45.0
Shale, medium gray.....	45.0	54.5
Zeandale Formation:		
Maple Hill Member:		
Limestone, medium gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	54.5	56.3
Wamego Member:		
Coal, black.....	56.3	56.4
Shale, light gray.....	56.4	62.0
Shale, light to medium gray.....	62.0	65.5
Tarkio Member:		
Limestone, cream, irregularly crystalline, contains fusulinids, <u>Osagia</u>	65.5	70.0
Willard Formation:		
Sandstone, reddish brown, interbedded with greenish gray, very fine grained.....	70.0	72.0
Shale, light gray.....	72.0	76.0

Shale, light to medium gray, silty, interbedded with sandstone, gray, very fine grained, thin.....	76.0	92.0
Shale, light to medium gray, slightly silty.....	92.0	103.0
Emporia Formation:		
Elmont Member:		
Limestone, light to medium bluish gray, irregularly crystalline, contains brachiopods, fusulinids.....	103.0	105.3
Shale, light gray.....	105.3	107.0
Limestone, light gray and light greenish gray, very finely crystalline.....	107.0	109.0
Harveyville Member:		
Shale, medium gray.....	109.0	113.6
Reading Member:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	113.6	116.8
Shale, medium gray.....	116.8	117.6
Limestone, medium gray, irregularly crystalline, contains brachiopods, crinoids.....	117.6	118.6
Auburn Formation:		
Shale, medium gray.....	118.6	122.0

Test Hole #98-40
2N 13E 27ddddd
Richardson County

Location: SE SE SE SE sec. 27, T. 2 N., R. 13 E., on west edge of
road, 180 feet north of southeast corner of section.
Ground elevation: 975.1 feet (a) (Humboldt 7.5 min. quadrangle)
Depth to water: 17.6 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:	0.0	6.0
Clay, dark gray to black.....	6.0	13.0
Clay, gray.....	13.0	19.0
Clay, silty, gray, with rusty streaks.....	19.0	25.0
Clay, silty, greenish gray.....	25.0	28.0
Clay, dark, bluish gray.....	28.0	36.0
Clay, silty, greenish gray, with rusty streaks.....	36.0	41.0
Sand, silty, gray.....	41.0	45.5
Sand and gravel, fine.....	45.5	49.0
Gravel, fine to coarse.....		
Pennsylvanian System - Virgil Series - Wabaunsee Group:	49.0	50.5
Shale, dark gray.....	50.5	
Limestone, hard.....		

Test Hole #24-78
2N 13E 28abbb
Richardson County

Location: NW corner NE sec. 28, T. 2 N., R. 13 E., 17 feet south of north section line, and 2,630 feet west of east section line.

Ground elevation: 1,105.0 ft

(Humboldt SW 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Clay, yellowish brown.....	1.0	8.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Maple Hill Member:		
Limestone, yellowish brown, irregularly crystalline, highly weathered, contains brachiopods, crinoids..	8.5	9.5
Wamego Member:		
Shale, olive yellow.....	9.5	16.0
Shale, medium gray.....	16.0	24.5
Tarkio Member:		
Limestone, white to cream, irregularly crystalline, contains fusulinids, <i>Osagia</i>	24.5	26.0
Shale, light bluish gray.....	26.0	26.2
Limestone, light gray, finely crystalline.....	26.2	27.0
Willard Formation:		
Shale, reddish brown, interbedded with olive, greenish gray.....	27.0	32.0
Shale, light gray.....	32.0	58.9
Emporia Formation:		
Elmont Member:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids.....	58.9	61.0
Shale, light gray.....	61.0	62.5
Shale, light greenish gray.....	62.5	63.5
Limestone, light greenish gray, very finely crystalline, and light tannish gray, irregular crystalline.....	63.5	65.0
Harveyville Member:		
Shale, light to medium gray.....	65.0	68.8
Reading Member:		
Limestone, gray, fine to very finely crystalline, contains brachiopods, crinoids, bryozoans.....	68.8	72.0
Shale, medium gray.....	72.0	73.0

Limestone, light to medium gray, finely to very finely crystalline, contains brachiopods, crinoids	73.0	74.1
Auburn Formation:		
Shale, light gray.....	74.1	78.0
Shale, light greenish gray.....	78.0	79.0
Shale, reddish gray.....	79.0	82.0
Shale, olive.....	82.0	85.0
Shale, light to medium gray.....	85.0	97.5
Wakarusa Formation:		
Limestone, light to medium bluish gray, finely to very finely crystalline, contains brachiopods, crinoids, fusulinids.....	97.5	100.4
Shale, dark gray to black.....	100.4	100.5
Limestone, light to medium bluish gray, very finely crystalline, contains brachiopods, crinoids.....	100.5	101.0
Soldier Creek Formation:		
Shale, light gray.....	101.0	108.5
Burlingame Formation:		
South Fork Member:		
Limestone, brownish gray, very finely crystalline to dense.....	108.5	109.5
Shale, reddish gray.....	109.5	110.0
Limestone, white to light gray, finely crystalline, contains algal material.....	110.0	112.5
Winnebago Member:		
Shale, light to medium gray.....	112.5	119.5
Taylor Branch Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, pyrite.....	119.5	120.5
Shale, medium gray.....	120.5	122.5
Limestone, bluish gray, pebbly texture, contains algal material.....	122.5	123.5
Shale, light to medium gray.....	123.5	125.0

Test Hole #20-78
2N 13E 31CDDC
Richardson County

Location: Center south line SE SE SW sec. 31, T. 2 N., R. 13 E.,
25 feet north of south section line, and 2,305 feet east
of west section line.
Ground elevation: 1,097.0 ft (Du Bois 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample)..... 0.0 3.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Zeandale Formation:

Wamego Member:

Shale, yellowish brown..... 3.0 10.0
Shale, gray, mottled with olive..... 10.0 13.0

Tarkio Member:

Limestone, yellow and reddish gray, finely
crystalline, contains brachiopods, crinoids..... 13.0 14.0
Shale, reddish brown..... 14.0 15.0
Limestone, yellowish brown, very finely crystalline,
contains Osagia, fusulinids, manganese staining... 15.0 16.5

Willard Formation:

Shale, reddish gray, mottled with greenish gray..... 16.5 17.0
Shale, reddish brown..... 17.0 20.0
Shale, greenish gray..... 20.0 22.0
Shale, reddish gray..... 22.0 23.0
Shale, greenish gray..... 23.0 26.0
Shale, light to medium gray, mottled with olive..... 26.0 29.0
Shale, light to medium gray..... 29.0 43.0
Shale, medium gray, limy..... 43.0 50.5

Emporia Formation:

Elmont Member:

Limestone, bluish gray, very finely crystalline,
contains brachiopods, fusulinids..... 50.5 52.7
Shale, medium gray..... 52.7 56.0
Limestone, light gray, very finely crystalline..... 56.0 56.2

Harveyville Member:

Shale, light to medium gray, mottled with olive..... 56.2 60.6

Reading Member:

Limestone, gray, very finely crystalline, contains
brachiopods, crinoids..... 60.6 63.5
Shale, medium gray..... 63.5 64.4
Limestone, light to medium gray, irregularly
crystalline, contains brachiopods, crinoids..... 64.4 66.4

Auburn Formation:

Shale, medium gray.....	66.4	68.5
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	68.5	68.9
Shale, greenish gray.....	68.9	69.2
Shale, reddish brown.....	69.2	74.0
Shale, olive, mottled with gray.....	74.0	76.0
Shale, medium gray.....	76.0	77.0

Test Hole #99-40
2N 13E 34adad
Richardson County

Location: SE NE SE NE sec. 34, T. 2 N., R. 13 E., on west edge of road, 1,689 feet south of the northeast corner of section.

Ground elevation: 964.6 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 24.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, black to brownish gray.....	0.0	8.0
Clay, silty, buff.....	8.0	15.0
Silt, buff.....	15.0	25.0
Sand, fine to coarse, contains some limestone chips		
below 30.0 ft.....	25.0	39.0

Test Hole #100-40
2N 13E 34dadd
Richardson County

Location: SE SE NE SE sec. 34, T. 2 N., R. 13 E., on west edge of road, 3,854 feet south of northeast corner of section.

Ground elevation: 975.3 feet (a) (Humboldt SW 7.5 min. quadrangle)

Depth to water: 22.0 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill.....	0.0	2.0
Sand, clayey, brownish buff.....	2.0	18.0
Silt, sandy, gray.....	18.0	24.0
Gravel, reddish brown.....	24.0	25.0
Sand, silty, gray.....	25.0	35.0
Gravel, gray, fine to coarse, contains large limestone pebbles below 40.5 ft.....	35.0	42.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, red.....	42.5	46.0
Shale, dark bluish gray.....	46.0	48.0
Limestone, hard.....	48.0	

Test Hole #30-B-67 (1)
2N 14E 6cbcc
Richardson County

Location: SW SW NW SW sec. 6, T. 2 N., R. 14 E., 1,409 feet north of
 south section line, and 5 feet east of west section line.

Ground elevation: 1,162.0 feet (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Top soil.....	0.0	1.0
Clay, very silty, moderately sandy, very fine to fine, yellowish brown.....	1.0	4.0
Silt, slightly to moderately clayey, moderately sandy, very fine to medium, reddish yellow to brown.....	4.0	14.2
Sand and gravel, medium to coarse sand, fine to gravel, 40%.....	14.2	16.0
Till, clayey, very sandy, very fine to medium, olive brown to light gray, some reddish brown mottling..	16.0	26.2
No sample (lost circulation).....	26.2	28.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone (no sample).....	28.0	

Test Hole #117-40
2N 14E 17ccbb
Richardson County

Location: NW NW SW SW sec. 17, T. 2 N., R. 14 E., on east edge of
road 440 feet south of the railroad.
Ground elevation: 963.5 feet (a) (Humboldt 7.5 min. quadrangle)
Depth to water: 19.95 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	5.0
Clay, brownish gray.....	5.0	15.0
Clay, sandy, gray to rust.....	15.0	19.0
Sand, fine, clayey.....	19.0	30.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, calcareous, weathered, buff, contains calcite, pink to white.....	30.0	33.0
Shale, gray.....	33.0	33.5
Shale, calcareous, gray.....	33.5	34.0
Shale, dark gray to black.....	34.0	34.7
Limestone, hard, dark gray.....	34.7	36.0
Shale, hard, dark gray, contains some siltstone.....	36.0	37.5
Shale, light gray.....	37.5	39.0

Test Hole #118-40
2N 14E 17bcbc
Richardson County

Location: SW NW SW NW sec. 17, T. 2 N., R. 14 E., on east edge of
road, 1,848 feet south of the northwest corner of section.
Ground elevation: 976.2 feet (a) (Humboldt 7.5 min. quadrangle)
Depth to water: 15.7 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray.....	0.0	3.0
Clay, dark brown.....	3.0	6.0
Clay, gray.....	6.0	17.0
Clay, silty, brownish gray.....	17.0	23.0
Clay, silty, buff, with iron stain.....	23.0	28.0
Clay, silty, gray.....	28.0	32.0
Silt, dark brown.....	32.0	36.0
Sand, clayey, greenish gray.....	36.0	40.0
Gravel, greenish gray, contains extensive limestone and water-worn shale.....	40.0	42.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, weathered, grayish buff.....	42.0	44.8
Shale, carbonaceous, dark gray to black, contains plant fossils.....	44.8	45.3
Shale, bluish gray, with some yellow.....	45.3	45.8
Limestone, very hard.....	45.8	46.3

Test Hole #119-40
2N 14E 17ccbc
Richardson County

Location: SW NW SW SW sec. 17, T. 2 N., R. 14 E., on east edge of
road, 739 feet north of southwest corner of section.
Ground elevation: 962.5 feet (a) (Humboldt 7.5 min. quadrangle)
Depth to water: 18.1 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray.....	0.0	4.0
Clay, brownish gray.....	4.0	18.0
Clay, silty, gray.....	18.0	27.0
Silt, sandy, gray, slightly gravelly.....	27.0	30.0
Clay, silty, gray.....	30.0	37.5
Silt, sandy, gray.....	37.5	45.0
Gravel, gray, fine to coarse.....	45.0	53.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, weathered.....	53.0	54.0
Shale, gray.....	54.0	56.0
Limestone, very hard.....	56.0	

Test Hole 116-40
2N 14E 20bbcb
Richardson County

Location: Center west line NW NW sec. 20, T. 2 N., R. 14 E., on east edge of road, 660 feet south of northwest corner of section.
 Ground elevation: 961.3 feet (a) (Humboldt 7.5 min. quadrangle)
 Depth to water: 15.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, gray.....	0.0	10.0
Clay, brownish gray.....	10.0	15.0
Clay, silty, gray, contains rusty streaks.....	15.0	20.0
Sand, silty, clayey, gray to buff.....	20.0	26.5
Gravel, light yellow, gray, green, white, fine to coarse.....	26.5	31.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, calcareous, hard, gray, contains some very hard calcareous layers.....	31.0	34.5
Limestone.....	34.5	

Test Hole #121-40
2N 14E 21baab
Richardson County

Location: NW NE NE NW sec. 21, T. 2 N., R. 14 E., on south edge of road, 2,164 feet east of northwest corner of section.

Ground elevation: 939.29 feet (a) (Dawson 7.5 min. quadrangle)

Depth to water: 10.3 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	3.0
Clay, brown.....	3.0	15.0
Clay, brown, gray, contains rusty streaks.....	15.0	26.5
Clay, silty, bluish gray.....	26.5	30.0
Clay, silty, sandy, gray, slightly gravelly.....	30.0	34.0
Gravel, yellowish gray, fine to coarse, some large pebbles below 36.0 ft.....	34.0	39.5
Permian System - Big Blue Series - Admire Group:		
Shale, dark bluish gray to black.....	39.5	45.9
Limestone, hard.....	45.9	46.2
Shale, hard, bluish gray to black.....	46.2	47.0
Shale, calcareous, light gray.....	47.0	48.0
Limestone, hard.....	48.0	

Test Hole #87-40
2N 14E 22acad
Richardson County

Location: SE NE SW NE sec. 22, T. 2 N., R. 14 E., on south edge of road in southeast part of town of Dawson, 792 feet east of highway 75 and 150 feet north of railroad.

Ground elevation: 949.3 feet (a) (Dawson 7.5 min. quadrangle)

Depth to water: 12.2 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, gray to black.....	0.0	9.0
Clay, brownish gray.....	9.0	26.0
Clay, silty, gray.....	26.0	35.0
Sand, silty, gray.....	35.0	39.0
Gravel, yellowish gray, fine to coarse.....	39.0	48.5
Permian System - Big Blue Series - Admire Group:		
Shale, light gray.....	48.5	50.5
Limestone or shale, calcareous, light gray.....	50.5	51.0

Test Hole #120-40**2N 14E 22ccbb****Richardson County**

Location: Center west line SW sec. 22, T. 2 N., R. 14 E., on south edge of road, 1,320 feet north and 100 feet east of southwest corner of section.

Ground elevation: 948.7 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 16.4 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, black.....	0.0	5.0
Clay, gray.....	5.0	14.0
Clay, gray to buff, with rusty streaks.....	14.0	18.0
Clay, silty, greenish gray.....	18.0	24.5
Sand and gravel, fine to coarse, contains water-worn shale below 33.0 ft.....	24.5	34.0
Permian System - Big Blue Series - Admire Group:		
Limestone, gray, contains hard layers.....	34.0	35.0

Test Hole #96-40
2N 14E 31ddad
Richardson County

Location: SE NE SE SE sec. 31, T. 2 N., R. 14 E., on west edge of
road, 792 feet north of southeast corner of section.
Ground elevation: 953.9 feet (a) (Humboldt SW 7.5 min. quadrangle)
Depth to water: 20.45 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill and soil, clayey, dark brown.....	0.0	6.0
Clay, silty, gray.....	6.0	19.0
Clay, silty, gray, greenish gray, with rusty streaks	19.0	28.0
Sand, silty, gray.....	28.0	30.0
Gravel, gray, fine to coarse, contains large pieces of water-worn shale and limestone below 37.0 ft...	30.0	39.0
Permian System - Big Blue Series - Admire Group:		
Shale, olive gray, black.....	39.0	40.0
Shale, dark bluish gray, black.....	40.0	43.5
Limestone, hard, dark gray.....	43.5	

Test Hole #88-40
2N 14E 33ddda
Richardson County

Location: NE SE SE SE sec. 33, T. 2 N., R. 14 E., on west edge of
road 528 feet north of the southeast corner of section.

Ground elevation: 954.6 feet (a) (Humboldt 7.5 min. quadrangle)

Depth to water: 17.1 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, dark brown.....	0.0	3.0
Clay, gray to brown.....	3.0	11.0
Clay, gray, with rust streaks.....	11.0	20.0
Clay, sandy, gray, greenish gray.....	20.0	27.0
Gravel, reddish brown, coarse.....	27.0	43.0

Permian System - Big Blue Series - Admire Group:

Shale, gray, red.....	43.0	47.5
Limestone, hard.....	47.5	

Test Hole #147-40
2N 15E 3cccc
Richardson County

Location: SW corner sec. 3, T. 2 N., R. 15 E., on north edge of road,
 60 feet east of southwest corner of section.
 Ground elevation: 935.0 feet (t) (Verdon 7.5 min. quadrangle)
 Depth to water: 3.77 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	4.0
Clay, brownish gray.....	4.0	13.0
Clay, dark greenish gray to black.....	13.0	23.0
Clay, silty, greenish gray, with rust-colored streaks.....	23.0	26.0
Gravel, light gray to green, coarse texture.....	26.0	29.0
Sand and gravel, fine.....	29.0	31.5
Gravel, light gray, green, white, medium to coarse..	31.5	34.0
Sand, clayey, gray.....	34.0	48.0
Gravel, contains extensive limestone chips.....	48.0	49.5
Clay, sandy, dark gray.....	49.5	60.0
Limestone, contains limestone chips, pebbles, and fossils.....	60.0	67.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light gray.....	67.0	69.0

Test Hole #148-40
2N 15E 10accc
Richardson County

Location: SW SW SW NE sec. 10, T. 2 N., R. 15 E., 60 feet east of
 railroad, 2,640 feet east and 2,324 feet south of northeast corner
 of section.

Ground elevation: 933 feet (t) (Verdon 7.5 min. quadrangle)

Depth to water: 13.9 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill and soil, clayey, black.....	0.0	5.0
Clay, gray.....	5.0	11.0
Clay, silty, brownish gray.....	11.0	20.0
Clay, silty, dark gray.....	20.0	26.0
Clay, silty, limonitic concretions.....	26.0	27.0
Clay, sandy, greenish gray, with rusty streak.....	27.0	30.0
Gravel, pink, light to dark gray, coarse.....	30.0	35.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, dark gray.....	35.0	39.0
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Test Hole #145-40
2N 15E 15adaa
Richardson County

Location: NE NE SE NE sec. 15, T. 2 N., R. 15 E., on west edge of road, 1,372 feet south of the northeast corner of section.

Ground elevation: 930 feet (t) (Verdon 7.5 min. quadrangle)

Depth to water: 4.56 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, clayey, black.....	0.0	6.0
Clay, gray.....	6.0	15.0
Clay, silty, sandy, light gray.....	15.0	26.0
Sand, silty, gray.....	26.0	28.0
Gravel, light gray, fine to coarse.....	28.0	32.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, red.....	32.0	34.0
Shale, dark gray.....	34.0	37.0
Coal.....	37.0	37.2
Shale, gray.....	37.2	46.0
Coal.....	46.0	46.3
Shale, arenaceous, light gray.....	46.3	47.0
Shale, light gray, contains thin layer of sandstone at 47 ft.....	47.0	55.5
Limestone, hard, gray.....	55.5	56.5
Shale, light gray, contains thin layers of sandstone or calcareous shale.....	56.5	59.0

Test Hole #146-40
2N 15E 15daad
Richardson County

Location: SE NE NE SE sec. 15, T. 2 N., R. 15 E., on west edge of
road, 2,112 feet north of the southeast corner of section.
Ground elevation: 930 feet (t) (Verdon 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, dark gray to black.....	0.0	6.0
Clay, slightly brownish gray, with few rust-colored spots.....	6.0	21.0
Sand, silty, light bluish gray, rust-colored streaks	21.0	25.0
Sand and gravel, light gray, fine.....	25.0	28.0
Gravel, light gray, green, pink, white, coarse.....	28.0	31.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, and mudstone or limestone, gray.....	31.5	34.0
Shale, dark gray to black.....	34.0	35.0
Shale, light bluish gray.....	35.0	37.0
Shale, red.....	37.0	39.0

Test Hole #9-U-40
2N 15E 17dddd
Richardson County

Location: SE SE SE SE sec. 17, T. 2 N., R. 15 E., 264 feet west and
36 feet north of the southeast corner of section.
Ground elevation: 1,045.0 feet (t) (Verdon 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil.....	0.0	5.0
Clay, buff.....	5.0	18.0
Clay, reddish brown.....	18.0	34.0
Clay, slightly gravelly, fine.....	34.0	38.0
Sand, clayey.....	38.0	40.0
Sand and gravel, fine, contains boulders below 50.0 ft.....	40.0	62.5
Coal.....	62.5	63.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, bluish gray.....	63.0	77.0

Test Hole #144-40
2N 15E 23addd
Richardson County

Location: SE SE SE NE sec. 23, T. 2 N., R. 15 E., on west edge of
road, 200 feet north of the half section line.

Ground elevation: 940 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 8.85 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, clayey, silty, dark gray to black..	0.0	6.0
Clay, silty, brownish gray.....	6.0	15.0
Clay, silty, gray.....	15.0	25.0
Sand, silty, gray.....	25.0	35.0
Sand and gravel, fine.....	35.0	40.0
Gravel, compact, gray, fine to coarse, some large pebbles.....	40.0	45.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone, fossiliferous, dark gray.....	45.5	47.5
Shale, clayey, dark gray.....	47.5	47.7
Coal.....	47.7	48.0
Shale, bluish gray, contains mica.....	48.0	49.0

Test Hole #8-U-40
2N 15E 27aada
Richardson County

Location: NE SE NE NE sec. 27, T. 2 N., R. 15 E., 686 feet south and
 60 feet west of the northeast corner of section.

Ground elevation: 1,035 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 35.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	5.0
Clay, buff.....	5.0	14.0
Clay, brownish buff.....	14.0	35.0
Gravel, clayey, fine.....	35.0	38.5
Permian System - Big Blue Series - Council Grove Group:		
Limestone.....	38.5	41.0
Shale, black to olive gray.....	41.0	48.0
Limestone, grayish tan.....	48.0	48.5

Test Hole #82-40
2N 15E 30dbcc
Richardson County

Location: SW corner NW SE sec. 30, T. 2 N., R. 15 E., on east edge of road, 2,640 feet west and 1,360 feet north of the southeast corner of section.

Ground elevation: 941.7 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 12.35 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clay, reddish brown.....	0.0	3.0
Clay, reddish brown.....	3.0	11.0
Clay, silty, reddish brown.....	11.0	19.0
Clay, silty, gray, with rusty streaks.....	19.0	29.0
Silt, gray.....	29.0	40.0
Sand, fine to coarse.....	40.0	47.0
Gravel, fine, contains limestone boulders below 49.0 ft.....	47.0	50.5

Permian System - Big Blue Series - Council Grove Group:

Shale, dark bluish gray to black.....	50.5	56.0
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Test Hole #83-40
2N 15E 31abbb
Richardson County

Location: NW NW NW NE sec. 31, T. 2 N., R. 15 E., on east edge of road, 140 feet south of railroad, 2,640 feet west and 230 feet south of northeast corner of section.

Ground elevation: 921.5 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 7.1 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill, clayey, dark gray to black.....	0.0	5.0
Clay, gray.....	5.0	9.0
Clay, gray.....	9.0	15.0
Clay, silty, grayish brown.....	15.0	24.0
Clay, gray.....	24.0	29.0
Silt, sandy, gray.....	29.0	37.0
Sand, silty, gray.....	37.0	39.5
Gravel, gray, coarse, contains limestone chips.....		

Permian System - Big Blue Series - Admire Group:

Shale, gray, calcareous below 40.5 ft.....	39.5	41.0
Limestone, very hard.....	41.0	

Test Hole #84-40
2N 15E 31badd
Richardson County

Location: SE SE NE NW sec. 31, T. 2 N., R. 15 E., on west edge of road, 2,640 feet east and 1,161 feet south of northwest corner of section.

Ground elevation: 920.9 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: 12.9 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, silty, sandy, dark brown.....	0.0	5.0
Clay, silty, brown.....	5.0	24.0
Silt, sandy, gray.....	24.0	30.0
Gravel, light gray, coarse.....	30.0	31.0
Permian System - Big Blue Series - Admire Group:		
Shale, dark bluish gray.....	31.0	39.0

Test Hole #85-40
2N 15E 31accc
Richardson County

Location: SW SW SW NE sec. 31, T. 2 N., R. 15 E., on west edge of road, 2,640 feet west and 2,376 feet south of the northeast corner of section.

Ground elevation: 925.7 feet (a) (Humboldt SE 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, sandy, dark grayish brown.....	0.0	9.0
Clay, sandy, brown.....	9.0	23.0
Sand, silty, greenish gray.....	23.0	29.5
Gravel, gray, coarse.....	29.5	31.5

Permian System - Big Blue Series - Admire Group:

Shale, bluish gray.....	31.5	39.0
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Test Hole #71-40
2N 15E 34dbbb
Richardson County

Location: NW corner SE sec. 34, T. 2 N., R. 15 E., on east edge of road and west of railroad, 80 feet south of the northwest corner of the southeast quarter of the section.
 Ground elevation: 913.4 feet (a) (Salem 7.5 min. quadrangle)
 Depth to water: 6.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, clayey, dark brown to black.....	0.0	4.0
Clay, brownish gray.....	4.0	8.0
Clay, silty, buff to gray, with rusty streaks, contains iron concretions below 21.0 ft.....	8.0	25.0
Sand, silty, gray.....	25.0	27.0
Gravel, white and yellow, medium, contains shale and limestone fragments below 31.5 ft.....	27.0	33.0
Permian System - Big Blue Series - Admire Group:		
Shale, dark gray to black.....	33.0	37.0
Limestone, dark gray.....	37.0	38.5
Shale, bluish gray.....	38.5	39.0

Test Hole #72-40
2N 15E 31abbb
Richardson County

Location: NW corner NE sec. 34, T. 2 N., R. 15 E., on east edge of road, 2,640 feet west and 90 feet south of northeast corner of section.

Ground elevation: 930.0 feet (a) (Salem 7.5 min. quadrangle)

Depth to water: 4.95 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	2.0
Clay, silty, buff to gray, with rusty streaks.....	2.0	13.5
Gravel, red, coarse.....	13.5	15.0
Permian System - Big Blue Series - Admire Group:		
Shale, gray to brown.....	15.0	20.0
Shale, laminated, hard, dark gray.....	20.0	21.0
Shale, dark gray, contains mica.....	21.0	25.0
Shale, calcareous, greenish gray.....	25.0	33.0

Test Hole #56-40
2N 15E 35ccbb
Richardson County

Location: NW NW SW SW sec. 35, T. 2 N., R. 15 E., on east edge of
road, 1,108 feet north of the southwest corner of section.
Ground elevation: 920.0 feet (a) (Salem 7.5 min. quadrangle)
Depth to water: 15.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, silty, brown.....	0.0	4.0
Clay, silty, brown, buff, gray, sandy below 27.0 ft.	4.0	31.0
Sand and gravel, white, yellow, fine to coarse.....	31.0	35.0
Gravel, fine to coarse.....	35.0	45.0
Permian System - Big Blue Series - Admire Group:		
Shale, olive green.....	45.0	46.0
Shale, bluish gray to purple.....	46.0	47.0
Shale, light bluish gray.....	47.0	48.0

Test Hole #26-B-67
2N 15E 36ddad
Richardson County

Location: SE NE SE SE sec. 36, T. 2 N., R. 15 E., 827 feet north of
 south section line, and 7 feet west of east section line.
 Ground elevation: 1,056.0 feet (Salem 7.5 min. quadrangle)
 Depth to water: 23.30 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill (no sample).....	0.0	2.0
Clay, slightly to very silty, slightly sandy, gray with some yellowish brown mottling.....	2.0	11.5
Silt, slightly clayey, very sandy, very fine to very coarse, pale olive.....	11.5	15.0
Clay, slightly silty, slightly sandy, pale brown....	15.0	20.0
Till, clayey, slightly silty, moderately sandy, very fine to very coarse, slightly gravelly.....	20.0	27.8
Till, clayey, very slightly silty, moderately to very sandy, very fine to very coarse, light gray with some black and reddish brown mottling.....	27.8	32.0
Sand, very fine to very coarse, trace of gravel.....	32.0	33.0
Till, clayey, slightly silty, very sandy, very fine to coarse, light gray with reddish brown and black mottling.....	33.0	47.5
Till, clayey, moderately sandy, very fine to coarse, very dark gray.....	47.5	55.7
Silt, slightly clayey, moderately sandy, very fine to very coarse, olive yellow, with interbedded limestone boulder.....	55.7	56.8
Clay, slightly to moderately silty, gray.....	56.8	62.5
Till, clayey, moderately silty, slightly sandy, very fine to medium, dark gray.....	62.5	70.0
Permian System - Big Blue Series - Admire Group:		
Council Grove Formation:		
Hughes Creek Member:		
Shale, medium to dark gray, clayey.....	70.0	73.3
Shale, medium gray.....	73.3	74.4
Americus Member:		
Limestone, medium to dark gray, very finely crystalline, contains crinoids, brachiopods.....	74.4	75.5
Shale, dark gray, contains coal.....	75.5	76.6
Limestone, medium bluish gray, finely crystalline rhombs.....	76.6	77.0

Admire Group:**Hamlin Formation:****Oaks Member:**

Shale, medium to dark gray, trace of black carbonaceous.....	77.0	79.5
Limestone, light greenish gray, very finely crystalline, interbedded with shale, light greenish gray.....	79.5	89.0
Shale, light greenish gray, mottled with a trace of pale red, interbedded with limestone, light greenish gray.....	89.0	90.0
Shale, light greenish gray, contains very fine mica.	90.0	92.5
Shale, pale olive, contains very fine mica.....	92.5	94.0
Shale, light greenish gray, very fine mica.....	94.0	94.4

Houchens Creek Member:

Dolomite Limestone, light brown, very finely crystalline.....	94.4	95.0
Shale, very light greenish gray, interbedded with light gray, contains very fine sandstone seams....	95.0	95.5
Dolomite Limestone, light brown, very finely crystalline.....	95.5	95.8
Shale, light to medium gray, contains very fine mica	95.8	96.0
Dolomite Limestone, light brownish gray, very finely crystalline, interbedded with shale, light greenish gray.....	96.0	96.6

Stine Member:

Shale, medium gray.....	96.6	96.7
Sandstone, light greenish gray, contains very fine mica.....	96.7	98.5
Sandstone, light gray, very fine grained, contains very fine mica.....	98.5	99.5
Sandstone, light gray, contains black carbonaceous streaks.....	99.5	100.0
Sandstone, light gray, contains very fine mica.....	100.0	102.0
Shale, light to medium gray, clayey.....	102.0	107.0
Shale, medium to dark gray.....	107.0	108.4
Limestone, medium to dark gray, very finely crystalline.....	108.4	109.1
Shale, medium gray.....	109.1	109.5
Limestone, medium gray, very finely crystalline.....	109.5	110.0
Shale, greenish gray, mottled with medium gray.....	110.0	110.8
Limestone, brown, very finely crystalline.....	110.8	111.0
Shale, light greenish gray.....	111.0	114.5
Shale, light greenish gray, mottled with dark yellow.....	114.5	115.0
Shale, light greenish gray, mottled with yellowish brown and pale red.....	115.0	120.0
Shale, medium to dark gray, clayey.....	120.0	121.1

Five Point Formation:

Limestone, brownish gray, "algal," interbedded with shale, light greenish gray.....	121.1	122.2
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West Branch Formation:

Shale, light gray, clayey.....	122.2	125.6
Sandstone, light gray, very fine to finely grained, contains mica.....	125.6	126.5
Shale, light greenish gray.....	126.5	128.0
Limestone, light greenish gray, very finely crystalline, interbedded with shale, light greenish gray.....	128.0	130.9
Shale, light greenish gray, interbedded with limestone.....	130.9	134.0
Limestone, white, very finely crystalline, interbedded with shale, light greenish gray.....	134.0	135.0
Limestone, light gray, very finely crystalline, interbedded with shale, light greenish gray.....	135.0	139.0
Limestone, light and medium gray, interbedded with shale, medium gray.....	139.0	139.8
Shale, medium to dark gray, interbedded with limestone, medium gray.....	139.8	140.0
Shale, light greenish gray, interbedded with limestone, medium gray.....	140.0	140.5

Test Hole #20-U-40
2N 16E 1dddc
Richardson County

Location: SW SE SE SE sec. 1, T. 2 N., R. 16 E., 528 feet west and
 150 feet north of the southeast corner of the section.
 Ground elevation: 1,040 feet.0 (t) (Barada 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, silty.....	0.0	1.0
Clay, yellowish brown.....	1.0	18.0
Clay, loesslike, reddish and yellowish brown.....	18.0	27.0
Clay, silty, sandy, gravelly.....	27.0	30.0
Boulder.....	30.0	32.0
Clay, yellow, with greenish tint, slightly sandy....	32.0	40.0
Sand, clayey, light reddish brown.....	40.0	45.0
Clay, silty, gray, brown, iron staining, slightly sandy.....	45.0	59.0
Sand, white, medium, slightly clayey, brown.....	59.0	104.0
Clay, silty, gray, bluish black, black, slightly gravelly, brown, below 107.0 ft.....	104.0	119.0
Gravel, mostly limestone.....	119.0	124.0
Sand and gravel, mostly limestone.....	124.0	130.0
Gravel and limestone, light gray, slightly clayey...	130.0	133.0
Gravel, limestone chips, sandy, clayey, bluish gray.	133.0	150.0
Clay, silty, gray to bluish black, slightly gravelly	150.0	162.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Limestone.....	162.5	165.0

Test Hole #23-A-67
2N 16E 7CCCC
Richardson County

Location: SW SW SW SW sec. 7, T. 2 N., R. 16 E., 80 feet north of south section line, and 142 feet east of west section line.

Ground elevation: 1,012.0 feet (Verdon 7.5 min. quadrangle)

Depth to water: 50.25 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Top soil (no sample).....	0.0	0.5
Silt, granular, blocky, dark brown to dark yellowish brown.....	0.5	2.5
Silt, very slightly to moderately clayey, slightly sandy, some iron staining, brown to yellowish brown.....	2.5	19.7
Clay, silty, iron stained, yellowish brown to brown.	19.7	23.8
Clay, silty, iron stained, reddish brown.....	23.8	30.9
Clay, silty, slightly to moderately sandy, very fine to medium, brown to yellowish brown.....	30.9	40.0
Sand, silty, sand is very fine to medium.....	40.0	114.6
Silt, very slightly to moderately clayey, slightly sandy, very fine sand, light brownish gray to gray	114.5	165.5
Silt, slightly to very clayey, slightly to moderately sandy, dark gray to gray.....	165.5	180.0
Reworked gravel, cobbles and sand, contains some silty lenses.....	180.0	188.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Stotler Formation:		
Dry Member:		
Shale, light to medium gray, clayey, noncalcareous..	188.0	208.3
Dover Member:		
Limestone, medium to dark gray, finely crystalline, sandy, contains crinoids.....	208.3	209.5
Pillsbury Formation:		
Shale, light to medium gray, sandy.....	209.5	212.5
Limestone, cream, very finely crystalline to dense..	212.5	214.5
Shale, light greenish gray.....	214.5	218.0
Shale, light greenish gray, dark yellowish brown, interbedded with limestone, pale red.....	218.0	219.0
Shale, pale red, mottled with greenish gray and yellowish brown, contains very fine mica.....	219.0	222.0
Shale, pale olive, contains very fine mica.....	222.0	225.4
Shale, medium gray, contains very fine mica.....	225.4	239.0

Zeandale Formation:**Maple Hill Member:**

Limestone, medium to dark gray, interbedded with shale, medium gray.....	239.0	241.0
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Wamego Member:

Shale, light to medium gray.....	241.0	244.0
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Limestone, medium bluish gray, very finely crystalline, contains brachiopods, interbedded with shale, light gray.....	244.0	244.5
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Shale, medium to dark gray, trace of black carbonaceous.....	244.5	248.0
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Tarkio Member:

Limestone, cream, soft, contains glauconite, abundant fusulinids, interbedded with shale, light greenish gray.....	248.0	249.0
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Limestone, light brownish gray, very finely crystalline, contains fusulinids and glauconite...	249.0	250.5
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Limestone, very light greenish gray, very finely crystalline.....	250.5	252.8
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Willard Formation:

Shale, brownish gray, sandy, contains very fine mica	252.8	254.5
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Sandstone, light gray, contains very fine mica, interbedded with shale, light gray.....	254.5	260.5
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Test Hole #11-U-40
2N 16E 16CCCC
Richardson County

Location: SW corner sec. 16, T. 2 N., R. 16 E., near the southwest corner of the section.
Ground elevation: 990.0 feet (t) (Verdon 7.5 min. quadrangle)
Depth to water: not measured

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:	0.0	5.0
Soil, clayey.....	5.0	24.0
Clay, buff.....	24.0	46.0
Clay, reddish brown.....		
Sand and gravel, fine to coarse, slightly clayey, red.....	46.0	55.0
Gravel, medium to coarse, slightly clayey, white, slightly sandy.....	55.0	65.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:	65.0	75.0
Clay, white.....	75.0	94.0
Clay, silty, slightly gravelly.....	94.0	125.0
Shale, silty, sandy, light blue.....	125.0	155.0
Shale, light blue.....		

Test Hole #143-40
2N 16E 19aada
Richardson County

Location: NE SE NE NE sec. 19, T. 2 N., R. 16 E., on west edge of road, 739 feet south of the northeast corner of section.

Ground elevation: 900.8 feet (a) (Verdon 7.5 min. quadrangle)

Depth to water: artesian flow at rate of 4.5 gallons per minute

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, soil, clayey, dark brown to black.....	0.0	4.0
Clay, grayish buff, with rusty streaks.....	4.0	17.0
Clay, silty, gray.....	17.0	28.0
Sand, silty, greenish gray.....	28.0	39.0
Gravel, silty, dark gray, medium.....	39.0	41.5
Sand, silty, clayey, gray.....	41.5	90.0
Gravel and limestone pebbles, contains fossils.....	90.0	92.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, soft, buff to brown.....	92.0	94.0
Shale, contains limestone chips.....	94.0	96.0
Shale, bluish gray to red, contains thin, hard layer at 96.0 - 98.0 ft.....	96.0	99.0

Test Hole #141-40
2N 16E 27cbbc
Richardson County

Location: SW NW NW SW sec. 27, T. 2 N., R. 16 E., on east edge of road, 335 feet south of northwest corner of the southwest quarter of the section.

Ground elevation: 894.2 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 16.22 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black to gray.....	0.0	7.0
Clay, buff gray, with rusty streaks.....	7.0	18.0
Clay, silty, slightly sandy, gray.....	18.0	21.0
Gravel, reddish brown to gray, fine to coarse.....	21.0	30.0
Clay, silty, gray.....	30.0	31.0
Sand and gravel, fine to coarse.....	31.0	38.0
Clay, silty, greenish gray.....	38.0	41.0
Gravel, poorly sorted, contains limestone pebbles and fossils.....	41.0	46.0
Sand and gravel, fine, contains extensive brown limestone chips and fossils.....	46.0	48.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, light gray.....	48.0	49.0

Test Hole #142-40
2N 16E 28adaa
Richardson County

Location: NE NE SE NE sec. 28, T. 2 N., R. 16 E., on west edge of
road, 1,478 feet south of northeast corner of section.
Ground elevation: 897.7 feet (a) (Falls City 7.5 min. quadrangle)
Depth to water: 9.8 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, clayey, black.....	0.0	7.0
Clay, gray, with rusty streaks.....	7.0	9.0
Clay, silty, buff to gray, with rusty streaks.....	9.0	17.0
Sand, silty, gray, fine.....	17.0	25.0
Gravel, rust colored, medium.....	25.0	27.0
Clay, silty, sandy, gray.....	27.0	29.0
Gravel, green, fine to medium.....	29.0	38.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Clay, silty, dark gray.....	38.0	41.0
Shale, sandy, light gray.....	41.0	49.0
Shale, dark gray.....	49.0	55.0

Test Hole #5-U-40
2N 16E 28ccdc
Richardson County

Location: Center south line SW SW sec. 28, T. 2 N., R. 16 E., 660
feet east of the southwest corner of section.

Ground elevation: 995.0 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 46.0 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, buff.....	0.0	8.5
Clay, reddish brown, slightly sandy.....	8.5	19.0
Clay, yellow.....	19.0	33.0
Boulder, limestone.....	33.0	34.0
Clay, buff.....	34.0	44.0
Clay, sandy, buff.....	44.0	50.0
Sand, clayey, fine.....	50.0	80.0
Clay, sandy, gray, slightly gravelly, coarse.....	80.0	84.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray to olive gray.....	84.5	87.0
Shale, dark red.....	87.0	91.5
Limestone, bluish gray.....	91.5	92.0

Test Hole #6-U-40
2N 16E 30baba
Richardson County

Location: NE NW NE NW sec. 30, T. 2 N., R. 16 E., 1,795 feet east and
180 feet south of the northwest corner.

Ground elevation: 970.0 feet (t) (Salem 7.5 min. quadrangle)

Depth to water: 29.65 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	5.0
Clay, buff, tan.....	5.0	12.0
Sand, white, medium.....	12.0	24.0
Gravel, yellowish red, medium to coarse.....	24.0	38.0
Clay, sandy, brown.....	38.0	44.0
Clay, olive gray, possibly shale.....	44.0	49.0

Test Hole #24-A-67
2N 16E 30bbbc
Richardson County

Location: SW NW NW NW sec. 30, T. 2 N., R. 16 E., 346.0 feet south of north section line, and 9.0 feet east of west section line.

Ground elevation: 997.2 feet (Salem 7.5 min. quadrangle)

Depth to water: 14.51 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	1.0
Clay, silty, iron stained, brown.....	1.0	2.5
Silt, slightly to very clayey, brown.....	2.5	11.5
Clay, silty, slightly sandy, very fine, iron stained brown.....	11.5	12.0
Till, clayey, silty, sandy, slightly gravelly, iron stained, yellowish brown.....	12.0	22.6
Clay, silty, contains a few sand grains, iron stained, yellowish brown.....	22.5	28.0
Till, clayey, sandy, light olive brown.....	28.0	32.5
Silt, moderately to very clayey, very sandy, light olive gray.....	32.5	34.0
Sand, gravel and cobbles, silty.....	34.0	35.6
Silt, moderately to very clayey, very sandy, very fine to medium, light olive gray to grayish brown.	35.6	46.5
Silt, moderately clayey, slightly sandy, dark gray..	46.5	54.5
Clay, silty, dark gray.....	54.5	62.0
Silt, slightly to moderately clayey, slightly sandy, dark gray.....	62.0	86.2
Silt, moderately clayey, very dark grayish brown....	86.2	87.5
Clay, silty, greenish gray, contains interbedded siltstone.....	87.5	88.0
Reworked shale and limestone.....	88.0	90.8
Permian Series - Big Blue Series - Admire Group:		
Onaga Formation:		
Towle Member:		
Shale, pale olive, mottled with red and yellow.....	90.8	91.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Virgil Formation:		
Brownville Member:		
Shale, light greenish gray, with interbedded white limestone.....	91.5	92.0
Limestone, pale yellow, very finely crystalline, contains brachiopods, glauconite, interbedded pale yellow shale.....	92.0	93.6

Pony Creek - Plumb Members:

Sandstone, light gray, very finely grained, contains mica.....	93.6	95.4
Sandstone, reddish gray, very finely grained, contains very fine mica, interbedded with greenish gray.....	95.4	97.0
Shale, yellowish brown, mottled with pale red, contains very fine mica.....	97.0	98.0
Shale, greenish gray, mottled with red, hard.....	98.0	100.5
Shale, reddish gray.....	100.5	104.0
Shale, reddish brown, contains very fine mica, sandy	104.0	113.0
Shale, pale olive, contains very fine mica, sandy...	113.0	114.0
Shale, light gray, contains very fine mica.....	114.0	114.8
Shale, medium to dark gray, contains black carbonaceous streaks.....	114.8	117.6

Nebraska City Member:

Limestone, medium gray, very fine crystalline, contains brachiopods, crinoids, pyrite.....	117.6	118.7
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Root Formation:**French Creek Member:**

Shale, dark gray, contains pyrite.....	118.7	119.7
Sandstone, light gray, contains very fine mica, very finely grained, shaly.....	119.7	123.5
Shale, medium to dark gray, contains brachiopod fragments, pyrite.....	123.5	124.5
Sandstone, light greenish gray, contains very fine mica, shaly.....	124.5	132.0
Shale, medium to dark gray.....	132.0	133.5

Jim Creek Member:

Limestone, dark gray, impure, contains brachiopods, spines.....	133.5	134.0
Limestone, dark gray, interbedded with light gray shale.....	134.0	137.5

Friedrich Member:

Shale, light greenish gray, contains brachiopod fragments.....	137.5	138.0
Shale, light greenish gray.....	138.0	140.5

Test Hole #140-40
2N 16E 34bbbc
Richardson County

Location: SW NW NW NW sec. 34, T. 2 N., R. 16 E., on east edge of road, 528 feet south of the northwest corner of section.

Ground elevation: 897.0 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, clayey, black.....	0.0	5.0
Clay, dark gray.....	5.0	19.0
Clay, silty, sandy, bluish gray.....	19.0	27.5
Gravel, white, pink, green, fine to coarse.....	27.5	36.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale.....	36.5	39.0

Test Hole #161-40
2N 17E 18dcdd
Richardson County

Location: SE corner SW SE sec. 18, T. 2 N., R. 17 E., on north edge of road, approximately 1,450 feet west of southeast corner of section.

Ground elevation: 945.0 feet (t) (Barada 7.5 min. quadrangle)

Depth to water: 19.20 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Road fill, soil, sandy, clayey, dark brown.....	0.0	12.0
Clay, sandy, silty, grayish brown.....	12.0	17.0
Silt, dark gray to black.....	17.0	43.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone, pebbles, chips.....	43.5	45.0
Limestone, very hard.....	45.0	45.5

Test Hole #21-U-40
2N 17E 20ddcc
Richardson County

Location: Center south line SE sec. 20, T. 2 N., R. 17 E., 1,320
feet west of southeast corner of section.

Ground elevation: 980.0 feet (t) (Falls City 7.5 min. quadrangle)

Depth to water: 25.70 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	2.0
Clay, buff.....	2.0	8.0
Clay, grayish brown.....	8.0	16.0
Clay, dark brown to gray.....	16.0	29.0
Clay, silty, dark gray.....	29.0	35.0
Gravel, tannish gray, fine.....	35.0	48.0
Gravel, clayey, bluish gray, tan, fine.....	48.0	62.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, gray.....	62.5	72.0
Limestone, gray.....	72.0	75.0
Shale, gray.....	75.0	77.0

Test Hole #159-40
2N 17E 31ccdd
Richardson County

Location: Center south line SW sec. 31, T. 2 N., R. 17 E., on north edge of road, 1,320 feet east of southwest corner of the section.

Ground elevation: 892.3 feet (a) (Falls City 7.5 min. quadrangle)

Depth to water: 15.3 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Sand, clayey, dark brown.....	0.0	19.0
Clay, light gray, with rusty streaks.....	19.0	25.0
Clay, silty, bluish gray.....	25.0	33.0
Clay, silty, greenish gray.....	33.0	35.5
Clay, silty, gray, sandy, gravelly, fine.....	35.5	42.0
Clay, gray.....	42.0	53.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Limestone boulders, pebbles, slightly gravelly, coarse.....	53.0	67.5
Shale, gray.....	67.5	70.5
Limestone.....	70.5	71.0

Test Hole #30-40
2N 18E 29cddc
Richardson County

Location: SW SE SE SW sec. 29, T. 2 N., R. 18 E., on north edge of road, 2,006 feet east of the southwest corner of the section.

Ground elevation: 857.6 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 9.5 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, silty, sandy, clayey, dark brown.....	0.0	10.0
Sand and gravel, fine, gray.....	10.0	34.0
Clay, silty, greenish gray.....	34.0	41.0
Sand and gravel, fine.....	41.0	71.0
Coal.....	71.0	71.5
Gravel, gray, pink, coarse.....	71.5	77.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark brownish gray, contains mica.....	77.0	79.0

Test Hole #32-40
2N 18E 29ccdd
Richardson County

Location: SE SE SW SW sec. 29, T. 2 N., R. 18 E., on north edge of road, 1,056 feet east of the southwest corner of section.

Ground elevation: 855.1 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 12.4 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, silty, sandy, brown.....	0.0	8.0
Silt, bluish gray.....	8.0	12.0
Sand, fine.....	12.0	20.0
Sand and gravel, fine.....	20.0	26.0
Gravel, red, green, fine to coarse.....	26.0	28.0
Clay, sandy, gray.....	28.0	30.0
Sand and gravel, brown, green, fine.....	30.0	45.0
Gravel, fine to coarse, slightly sandy.....	45.0	49.0
Sand, fine, clayey, silty, gray.....	49.0	54.0
Sand and gravel, green, red, fine to medium.....	54.0	59.0
Gravel, dark greenish blue and red, coarse.....	59.0	66.0
Sand and gravel, green, red, fine to medium.....	66.0	74.5

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale, calcareous, gray, contains mica.....	74.5	77.0
Limestone, hard.....	77.0	

Test Hole #29-40
2N 18E 32bbbb
Richardson County

Location: NW NW NW NW sec. 32, T. 2 N., R. 18 E., 20 feet east and
 150 feet south of the northwest corner of the section.

Ground elevation: 863.1 feet (a) (Rulo 7.5 min. quadrangle)

Depth to water: 18.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, silty, sandy.....	0.0	10.0
Clay, silty, buff.....	10.0	20.0
Silt, gray.....	20.0	40.0
Sand, silty, gray, fine.....	40.0	60.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, sandy, gray, contains mica.....	60.0	69.0

Test Hole #31-40
2N 18E 32aaba
Richardson County

Location: NE NW NE NE sec. 32, T. 2 N., R. 18 E., on south edge of
road, 897 feet west of the northeast corner of the section.
Ground elevation: 859.3 feet (a) (Rulo 7.5 min. quadrangle)
Depth to water: 8.1 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, silty, sandy.....	0.0	2.0
Sand, gray, fine, slightly gravelly below 16.0 ft...	2.0	47.0
Clay, silty, gray.....	47.0	50.0
Gravel, fine, slightly sandy.....	50.0	77.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:

Shale.....	77.0	
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Test Hole #57-78
3N 13E 6dddd
Richardson County

Location: SE SE SE SE sec. 6 T. 3 N., R. 13 E., 300 feet north of
 south section line, and 2 feet west of east section line.
 Ground elevation: 1,110.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Sand, very fine to very coarse, silty, clayey.....	2.0	7.0
Silt, brown, sandy.....	7.0	17.0
Sand, medium to coarse, gravelly, fine to coarse....	17.0	32.0
Silt, gray, clayey.....	32.0	42.0
Silt, beige, clayey.....	42.0	57.0
Silt, medium to dark gray, clayey.....	57.0	67.0
Silt, light bluish gray, clayey.....	67.0	82.0
Silt, light bluish gray, interbedded with yellowish green, clayey.....	82.0	87.0
Silt, medium gray, clayey.....	87.0	96.0
Sand, very fine to medium.....	96.0	97.0
Silt, medium gray, clayey.....	97.0	107.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Root Formation:		
French Creek Member:		
Shale, reddish brown.....	107.0	109.0
Shale, light gray, mottled with olive.....	109.0	113.0
Shale, medium gray, interbedded with black.....	113.0	116.5
Sandstone, light gray, very fine grained.....	116.5	118.0
Shale, light gray.....	118.0	127.0
Shale, dark gray.....	127.0	129.3
Jim Creek Member:		
Limestone, medium gray, very finely crystalline, impure, contains brachiopods, crinoids, bryozoans.	129.3	129.8
Friedrich Member:		
Shale, light gray.....	129.8	139.5
Stotler Formation:		
Grandhaven Member:		
Limestone, light gray to cream, finely to very finely crystalline, contains brachiopods, crinoids, red and green staining.....	139.5	141.5
Dry Member:		
Shale, reddish brown, interbedded with gray.....	141.5	146.2

Limestone, light gray to cream, very finely crystalline, contains black inclusions, red and green staining.....	146.2	149.0
Shale, reddish brown.....	149.0	152.0
Shale, reddish brown, interbedded with limestone, greenish brown, dense.....	152.0	155.0
Shale, olive, interbedded with limestone, gray, finely crystalline.....	155.0	157.7
Shale, light to medium gray.....	157.7	167.0
Shale, light gray.....	167.0	177.0
Shale, light gray, silty.....	177.0	184.0
Dover Member:		
Limestone, medium gray, finely crystalline, contains brachiopods.....	184.0	184.5
Pillsbury Formation:		
Shale, light gray.....	184.5	186.5
Shale, light greenish gray, interbedded with limestone, greenish gray, dense.....	186.5	190.0
Shale, olive and gray, interbedded with limestone, tan, dense.....	190.0	193.0
Shale, greenish gray.....	193.0	194.0
Shale, medium gray.....	194.0	198.0
Zeandale Formation:		
Maple Hill Member:		
Limestone, light to medium gray, finely to very finely crystalline, contains brachiopods, pyrite, crinoids.....	198.0	200.5
Shale, medium to dark gray.....	200.5	203.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids, fusulinids, black, carbonaceous material.....	203.0	208.0
Wamego Member:		
Coal, black.....	208.0	209.5
Shale, light gray.....	209.5	212.0

Test Hole #56-78
3N 13E 7bccc
Richardson County

Location: SW corner NW sec. 7, T. 3 N., R. 13 E., 2,590 feet south of north section line, and 22 feet east of west section line.

Ground elevation: 1,135.0 ft (Table Rock 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Silt, brown, clayey.....	2.0	8.0
Sand, very fine to medium.....	8.0	62.0
Sand, very fine to coarse, gravelly, fine to medium.	62.0	92.0
Sand, very fine to coarse, interbedded with clay, brown.....	92.0	108.0
Silt, light brown, sandy.....	108.0	130.0
Sand, very fine to very coarse, gravelly, fine to medium.....	130.0	138.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Willard Formation:		
Shale, medium gray.....	138.0	139.0
Emporia Formation:		
Limestone, light to medium gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	139.0	141.0
Shale, light gray.....	141.0	142.9
Limestone, light gray, finely to very finely crystalline.....	142.9	143.5
Shale, light greenish gray.....	143.5	144.2
Limestone, light tannish gray, finely crystalline to dense.....	144.2	144.6
Harveyville Member:		
Shale, medium gray.....	144.6	147.2
Reading Member:		
Limestone, medium gray, finely to very finely crystalline, contains brachiopods, crinoids, fusulinids, algal material, pyrite, black inclusions.....	147.2	152.4
Auburn Formation:		
Shale, medium gray, interbedded with greenish gray..	152.4	155.5
Shale, reddish brown.....	155.5	159.0
Shale, medium gray.....	159.0	176.0
Wakarusa Formation:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids, fusulinids.....	176.0	180.0

Burlingame - Soldier Creek Formations:

Shale, light bluish gray.....	180.0	184.5
Shale, reddish brown.....	184.5	186.0
Siltstone, greenish gray.....	186.0	190.0
Shale, greenish gray, mottled with olive.....	190.0	194.0
Shale, medium gray.....	194.0	204.0

Taylor Branch Member:

Limestone, medium to dark gray, irregularly crystalline, contains brachiopods, crinoids, algal material.....	204.0	204.5
Shale, medium gray.....	204.5	206.0
Limestone, light tannish gray, very finely crystalline to dense.....	206.0	208.5

Scranton Formation:**Cedarvale - White Cloud Members:**

Shale, light to medium gray, silty.....	208.5	221.0
Shale, black.....	221.0	222.0
Shale, greenish gray.....	222.0	225.0
Shale, greenish gray, mottled with red, olive, and yellow.....	225.0	235.0
Shale, light gray.....	235.0	242.0

Test Hole #160-40
3N 13E 7addd
Richardson County

Location: SE SE SE NE sec. 7, T. 3 N., R. 13 E., on north edge of road, 2,640 feet south and 180 feet west of the northeast corner of section.

Ground elevation: 1,155 feet (t) (Humboldt 7.5 min. quadrangle)

Depth to water: 1.58 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, sandy, clayey.....	0.0	5.0
Sand, clayey, brownish gray.....	5.0	7.0
Sand, silty, black to gray.....	7.0	16.5
Gravel, yellow, fine to medium.....	16.5	31.0
Clay, brownish gray.....	31.0	35.0
Gravel, brown, yellow, fine to coarse, contains boulders of flint and limestone below 60.0 ft.....	35.0	69.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, dark gray.....	69.0	71.0

Test Hole #13-U-40
3N 13E 9dbdd
Richardson County

Location: SE SE NW SE sec. 9, T. 3 N., R. 13 E. 1,584 feet north and
 1,584 feet west of southeast corner of section.
 Ground elevation: 1,195.0 feet (t) (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, clayey, black.....	0.0	4.0
Clay, buff, reddish brown, sandy below 12.0 ft.....	4.0	25.0
Sand and gravel, clayey, yellow, fine.....	25.0	38.5
Clay, sandy, yellow, slightly gravelly.....	38.5	57.0
Sand, fine.....	57.0	78.0
Clay, yellow.....	78.0	80.0
Sand, fine to coarse.....	80.0	117.0

Permian System - Big Blue Series - Council Grove Group:

Bedrock.....	117.0
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Test Hole #53-78
3N 13E 21addd
Richardson County

Location: SE corner NE sec. 21, T. 3 N., R. 13 E., 5 feet north of
 south section line, and 22 feet west of east section line.
 Ground elevation: 1,107.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Clay, brown, silty.....	1.0	13.0
Sand, fine to very coarse, gravelly, very fine to medium.....	13.0	54.0
Silt, light tan.....	54.0	58.0
Silt, gray.....	58.0	66.0
Permian System - Big Blue Series - Council Grove Group:		
Stearns Formation:		
Shale, light greenish gray.....	66.0	68.0
Shale, reddish brown.....	68.0	70.0
Shale, reddish brown, interbedded with greenish gray	70.0	72.0
Beattie Formation:		
Morrill - Florena Members:		
Shale, cream to white.....	72.0	74.3
Limestone, white to light gray, very finely crystalline.....	74.3	75.0
Limestone, white to light gray, very finely crystalline, interbedded with shale, light gray...	75.0	76.2
Limestone, white to light gray, very finely crystalline, porous.....	76.2	77.0
Cottonwood Member:		
Limestone, cream, fine to irregularly crystalline, contains fusulinids.....	77.0	88.0
Eskridge Formation:		
Shale, light bluish gray.....	88.0	93.0
Shale, reddish brown.....	93.0	99.0
Shale, light gray.....	99.0	102.0
Shale, gray, interbedded with black.....	102.0	103.2
Limestone, medium gray, very finely crystalline.....	103.2	104.0
Shale, dark gray.....	104.0	104.8
Limestone, brownish gray, very finely crystalline to dense.....	104.8	105.5
Shale, medium gray, interbedded with limestone, tannish gray, dense.....	105.5	107.0
Shale, yellowish olive, silty.....	107.0	112.0
Shale, green, interbedded with red.....	112.0	114.0

Limestone, light tannish gray, very finely crystalline to dense.....	114.0	116.0
Limestone, light greenish gray, dense.....	116.0	116.7
Shale, pale olive.....	116.7	117.5
Shale, reddish brown.....	117.5	120.0
Shale, greenish gray, limy.....	120.0	122.0

Test Hole #29-B-67
3N 13E 24aaba
Richardson County

Location: NE NW NE NE sec. 24, T. 3 N., R. 13 E., 8 feet south of
north section line, and 747 feet west of east section line.
Ground elevation: 1,196.5 feet (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	3.0
Clay, moderately to very silty, slightly to moderately sandy, very fine to coarse.....	3.0	10.0
Silt, very clayey, very sandy, very fine to medium, brown.....	10.0	12.5
Clay, very slightly to slightly silty, moderately sandy, very fine to fine, yellowish brown, with some black mottling.....	12.5	15.0
Till, clayey, slightly to moderately silty, moderately sandy, very fine to fine, gray, mottled with yellowish brown and black, contains pebbles..	15.0	20.0
Sand, very fine to medium, some silt.....	20.0	25.0
Sand, fine to very coarse, 5% gravel, fine to medium	25.0	30.0
Sand, fine to very coarse, 20-25% gravel, fine to medium.....	30.0	35.0
Sand, very coarse, 20-25% gravel, fine to medium....	35.0	40.0
Sand, medium to coarse, 5% gravel.....	40.0	45.0
Sand, medium to very coarse, 5-10% gravel, fine to very coarse.....	45.0	50.0
Sand, medium to very coarse, 35-40% gravel, fine to coarse.....	50.0	54.4
Sandstone, medium sand cemented by lime, brownish gray.....	54.4	58.5
Silt, very slightly sandy, very fine to fine, yellow with black mottling.....	58.5	60.0
Gravel, heterogeneous, 20% coarse to very coarse, sand.....	60.0	63.9
Till, clayey, silty, sandy, very fine to medium, dark gray, contains a few pebbles.....	63.9	78.5
Till, clayey, sandy, dark gray, contains red and green shale fragments.....	78.5	83.6
Permian System - Big Blue Series - Council Grove Group:		
Easley Creek Formation:		
Shale, pale yellow, sandy, with interbedded medium red.....	83.6	84.8
Shale, pale olive.....	84.8	85.8
Shale, reddish brown, mottled with greenish gray....	85.8	86.5

Bader Formation:**Middleburg Member:**

Limestone, pale yellow, very finely crystalline, vuggy.....	86.5	86.7
Limestone, light gray, very finely crystalline.....	86.7	88.9
Limestone, brownish yellow, very finely crystalline.	88.9	89.1
Limestone, pale yellow, very fine to finely crystalline, vuggy.....	89.1	89.7

Hooser Member:

Shale, pale olive, sandy.....	89.7	93.5
Shale, pale to medium olive, sandy.....	93.5	93.7
Limestone, white, chalky to very finely crystalline, soft, sandy, with interbedded shale.....	93.7	95.0
Limestone, white, sandy, chalky, with interbedded shale.....	95.0	95.5
Limestone, white, yellow in part, chalky, interbedded with shale.....	95.5	97.5
Shale, pale to medium reddish brown.....	97.5	100.0
Shale, pale to medium reddish brown, with some interbedded yellowish brown limestone.....	100.0	102.5
Circulation lost at 102.5		

Test Hole #27-A-67
3N 13E 25daad
Richardson County

Location: SE NE NE SE sec. 25, T. 3 N., R. 13 E., 2,187 feet north
and 6 feet west of southeast corner.

Ground elevation: 1,178.0 feet (t) (Humboldt 7.5 min. quadrangle)

Depth to water: 17.62 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	2.0
Clay, silty, dark brown.....	2.0	3.0
Silt, very clayey, brown.....	3.0	3.5
Silt, moderately clayey, light olive brown, iron and manganese stain, below 8.0 ft light olive gray	3.5	8.7
Silt, slightly clayey, gray, iron and manganese stain.....	8.7	8.9
Silt, slightly clayey, grayish brown, iron and manganese stain.....	8.9	10.0
Silt, slightly clayey, slightly sandy, yellowish brown, sand is very fine to medium.....	10.0	11.4
Clay, silty, sandy, brown, sand is very fine to medium, below 13.0 ft yellowish brown.....	11.4	14.5
Till, clayey, silty, sandy, gravelly, yellowish gray, below 15.4 ft slightly calcareous, in places limy nodes, some iron and manganese stain, below 27.9 ft. pale brown, some olive and yellowish brown stain, below 27.9 ft. pale brown, some olive and yellowish brown.....	14.5	80.0
Till, clayey, silty, sandy, gravelly, slightly calcareous, gray.....	80.0	147.3
Permian System - Big Blue Series - Admire Group:		
Limestone, light gray, pale yellow, very finely crystalline.....	147.3	148.8
Shale, light greenish gray.....	148.8	151.4
Shale, light greenish gray, with a trace of red mottling.....	151.4	154.0
Shale, light greenish gray, with some interbedded limestone.....	154.0	154.3
Shale, light to medium gray.....	154.3	155.0
Shale, very light greenish gray, mottled with yellow	155.0	155.7
Limestone, white, chalky to very finely crystalline.	155.7	158.0

Test Hole #41-78
3N 13E 26CCCC
Richardson County

Location: SW corner sec. 26, T. 3 N., R. 13 E., 20 feet north of
 south section line, and 100 feet east of west section line.
 Ground elevation: 1,142.0 (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	2.0
Clay, light brown.....	2.0	9.0
Clay, reddish brown, silty.....	9.0	14.0
Clay, reddish brown, silty, sandy.....	14.0	17.0
Sand, medium to coarse.....	17.0	36.5

Permian System - Big Blue Series - Council Grove Group:**Foraker Formation:****Hughes Creek Member:**

Limestone, medium gray, very finely crystalline, impure, contains brachiopods.....	36.5	37.0
Shale, medium gray.....	37.0	40.5
Limestone, medium gray, finely crystalline, contains crinoids.....	40.5	41.0
Shale, light to medium gray, limy.....	41.0	46.0
Shale, medium to dark gray.....	46.0	50.0
Limestone, medium to dark gray, finely crystalline, contains brachiopods, crinoids.....	50.0	52.0
Shale, light to medium gray.....	52.0	59.3
Shale, medium gray, limy.....	59.3	61.0

Americus Member:

Limestone, medium to dark gray, finely crystalline, contains brachiopods, crinoids.....	61.0	61.7
Shale, dark gray.....	61.7	62.5
Limestone, medium to dark gray, irregularly crystalline, contains brachiopods, crinoids, interbedded with shale, black.....	62.5	63.0

Admire Group:**Hamlin Formation:****Oaks Member:**

Shale, medium gray.....	63.0	66.0
Shale, greenish gray.....	66.0	70.0
Shale, light gray, interbedded with pale red, limy..	70.0	75.0
Shale, light greenish gray to cream, limy.....	75.0	78.0

Hughes Creek Member:

Limestone, light tannish gray, very finely crystalline.....	78.0	79.5
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Stine Member:		
Shale, light gray.....	79.5	83.0
Shale, light to medium gray.....	83.0	88.0
Shale, medium to dark gray.....	88.0	93.0
Limestone, light to medium gray, very finely crystalline, contains brachiopods.....	93.0	93.5
Shale, light gray.....	93.5	96.0
Limestone, light gray, very finely crystalline.....	96.0	97.0
Shale, light gray.....	97.0	97.5
Limestone, light gray, very finely crystalline.....	97.5	99.5
Shale, medium gray.....	99.5	101.0
Five Point Formation:		
Limestone, cream, irregularly crystalline.....	101.0	101.8
West Branch Formation:		
Shale, light gray.....	101.8	108.0
Shale, light greenish gray, interbedded with pale red, limy.....	108.0	111.0
Shale, light to medium gray.....	111.0	113.6
Shale, light gray, limy.....	113.6	115.0
Shale, medium gray.....	115.0	122.0
Falls City Formation:		
Lehmer Member:		
Limestone, gray, very finely crystalline.....	122.0	124.5
Reserve Member:		
Shale, light gray.....	124.5	129.0
Miles Member:		
Limestone, light to medium gray, irregularly crystalline, contains black inclusions.....	129.0	131.0
Onaga Formation:		
Hauxby - Towle Members:		
Shale, light greenish gray, limy.....	131.0	134.0
Shale, light greenish gray, interbedded with pale red.....	134.0	138.0
Shale, reddish brown.....	138.0	143.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light gray and greenish gray, very finely crystalline, contains brachiopods and glauconite..	143.0	145.0
Pony Creek - Plumb Members:		
Shale, olive.....	145.0	147.0
Shale, reddish brown.....	147.0	152.0

Test Hole #49-78
3N 13E 26bccc
Richardson County

Location: SW corner NW sec. 26 T. 3 N., R. 13 E., 2,635 feet south of
north section line, and 20 feet east of west section line.
Ground elevation: 1,145.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Silt, brown, clayey.....	2.0	9.0
Silt, reddish brown, sandy.....	9.0	14.0
Sand, medium to very coarse, gravelly, very fine to coarse, interbedded with clay, brown.....	14.0	25.0
Sand, medium to very coarse, gravelly, very fine to coarse.....	25.0	53.0
Permian System - Big Blue Series - Council Grove Group:		
Red Eagle Formation:		
Bennett Member:		
Shale, pale yellow, sandy, silty.....	53.0	55.0
Shale, black.....	55.0	59.7
Glenrock Member:		
Limestone, pale yellow, very finely crystalline.....	59.7	60.2
Shale, light gray, limy.....	60.2	62.0
Johnson Formation:		
Shale, yellowish olive.....	62.0	74.5
Foraker Formation:		
Long Creek Member:		
Limestone, yellowish brown, irregularly to very finely crystalline, porous, vuggy, contains algal material.....	74.5	80.0
Hughes Creek Member:		
Shale, pale yellow, interbedded with limestone, yellow, dense.....	80.0	84.0
Shale, light to medium gray.....	84.0	92.0
Shale, light gray.....	92.0	96.5
Limestone, medium to dark gray, finely crystalline, contains brachiopods.....	96.5	97.5
Shale, black, contains brachiopods, fusulinids.....	97.5	101.2
Shale, medium gray.....	101.2	104.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	104.0	104.5
Shale, light gray.....	104.5	106.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	106.0	109.3

Shale, medium gray.....	109.3	113.5
Limestone, medium gray, finely crystalline, contains brachiopods, algal material.....	113.5	115.5
Shale, medium gray.....	115.5	124.5
Americus Member:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	124.5	125.0
Shale, black.....	125.0	125.5
Limestone, light to medium gray, finely crystalline, contains brachiopods, crinoids.....	125.5	126.0
Admire Group:		
Hamlin Formation:		
Oaks - Stine Members:		
Shale, medium to dark gray.....	126.0	129.4
Shale, light gray, limy.....	129.4	130.3
Shale, greenish gray, limy.....	130.3	135.0
Shale, greenish gray, interbedded with pale red.....	135.0	139.0
Shale, light tan to cream.....	139.0	143.0
Shale, light tan to cream, interbedded with siltstone, tan.....	143.0	146.0
Shale, medium gray.....	146.0	149.0
Shale, olive gray.....	149.0	152.0

Test Hole #54-78
3N 13E 26bbbb
Richardson County

Location: NW corner sec. 26, T. 3 N., R. 13 E., 15 feet south of
north section line, and 10 feet east of west section line.
Ground elevation: 1,154.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	3.0
Silt, brown, clayey.....	3.0	8.0
Silt, reddish brown, clayey.....	8.0	12.0
Silt, orange brown, clayey.....	12.0	19.0

Permian System - Big Blue Series - Council Grove Group:

Funston Formation:

Limestone, pale yellow, irregularly crystalline, porous.....	19.0	24.0
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Blue Rapids Formation:

Shale, greenish gray.....	24.0	30.5
Limestone, pale yellow, coarsely crystalline.....	30.5	31.0
Shale, pale yellow.....	31.0	35.0
Limestone, light gray, very finely crystalline.....	35.0	35.4
Shale, olive, interbedded with beige.....	35.4	39.0
Limestone, light gray, very finely crystalline.....	39.0	40.0
Shale, yellowish olive.....	40.0	41.0
Shale, reddish brown, mottled with gray.....	41.0	46.0
Shale, medium gray.....	46.0	48.0
Shale, light greenish gray.....	48.0	50.5

Crouse Formation:

Limestone, white to light gray, finely to very finely crystalline.....	50.5	51.0
Limestone, light tan, dense, interbedded with shale, cream.....	51.0	54.0
Shale, yellowish olive.....	54.0	56.5
Limestone, medium gray, finely to very finely crystalline, contains crinoids.....	56.5	57.4
Shale, dark gray.....	57.4	59.0
Shale, dark gray, mottled with olive.....	59.0	61.1
Limestone, light tannish gray, very finely		

Easley Creek Formation:

Shale, brown.....	62.4	63.0
Shale, cream.....	63.0	69.0
Shale, pale olive.....	69.0	71.0
Shale, pale olive, interbedded with gray.....	71.0	73.0
Shale, reddish brown.....	73.0	76.0

Shale, reddish brown, interbedded with greenish gray	76.0	78.0
Shale, olive, interbedded with sandstone, brown, fine grained.....	78.0	80.0
Bader Formation:		
Middleburg Member:		
Limestone, light gray, fine to very finely crystalline, contains red and yellow staining.....	80.0	81.5
Shale, medium gray.....	81.5	82.5
Limestone, light to medium gray, very finely crystalline.....	82.5	84.2
Hooser Member:		
Shale, light to medium gray.....	84.2	87.5
Shale, light gray, limy.....	87.5	90.0
Shale, reddish brown, mottled with greenish gray....	90.0	92.0
Eiss Member:		
Limestone, cream, finely to coarsely crystalline, contains red staining.....	92.0	96.0
Shale, medium gray.....	96.0	105.0
Limestone, light to medium gray, finely to very finely crystalline, contains brachiopods.....	105.0	106.5
Stearns Formation:		
Shale, light greenish gray.....	106.5	111.0
Shale, reddish brown.....	111.0	116.6
Beattie Formation:		
Morrill - Florena Members:		
Limestone, white, very finely crystalline to dense, interbedded with shale, greenish gray.....	116.6	121.3
Cottonwood Member:		
Limestone, cream, irregularly crystalline, porous, contains fusulinids, gypsum.....	121.3	132.0
Eskridge Formation:		
Shale, olive gray.....	132.0	133.0
Shale, light gray.....	133.0	137.0

Test Hole #40-78
3N 13E 27CDDD
Richardson County

Location: SE corner SW sec. 27, T. 3 N., R. 13 E., 10 feet north of
 south section line, and 2,900 feet west of east section line.
 Ground elevation: 1,113.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	2.0
Silt, yellowish brown, sandy.....	2.0	9.6

Permian System - Big Blue Series - Council Grove Group:

Foraker Formation:

Long Creek Member:

Limestone, yellow, very finely crystalline, highly weathered.....	9.6	10.0
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Hughes Creek Member:

Shale, yellow.....	10.0	17.0
Shale, yellowish olive.....	17.0	22.5
Shale, light gray.....	22.5	24.4
Limestone, medium to dark gray, very finely crystalline, contains brachiopods.....	24.4	25.0
Shale, black.....	25.0	27.0
Shale, light to medium gray.....	27.0	27.5
Limestone, light gray, finely crystalline, contains brachiopods, fusulinids.....	27.5	29.0
Shale, medium gray.....	29.0	32.0
Shale, medium gray, interbedded with limestone, gray, irregularly crystalline, contains brachiopods.....	32.0	35.0
Limestone, light gray, irregularly crystalline, contains brachiopods, interbedded with shale, medium gray.....	35.0	39.0
Shale, medium to dark gray.....	39.0	42.0
Limestone, bluish gray, pebbly texture, contains brachiopods, crinoids, algal material.....	42.0	42.8
Shale, medium gray.....	42.8	50.6

Americus Member:

Limestone, dark gray, irregularly crystalline, impure, contains brachiopods, crinoids.....	50.6	51.5
Shale, light gray.....	51.5	52.0
Limestone, medium to dark gray, irregularly crystalline, contains brachiopods, crinoids.....	52.0	53.0
Shale, dark gray to black.....	53.0	53.8

Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids.....	53.8	54.1
Admire Group:		
Hamlin Formation:		
Shale, dark gray.....	54.1	57.5
Shale, light gray, limy.....	57.5	62.0
Shale, greenish gray, limy.....	62.0	63.0
Shale, pale red, limy.....	63.0	65.0
Shale, light greenish gray, limy.....	65.0	70.0
Shale, pale reddish brown, limy.....	70.0	70.7
Shale, light gray to light greenish gray.....	70.7	74.0
Shale, medium gray.....	74.0	82.0
Shale, medium gray, limy.....	82.0	85.9
Limestone, light gray, very finely crystalline.....	85.9	88.0
Shale, light gray to light greenish gray.....	88.0	90.0
Shale, light gray, interbedded with olive.....	90.0	92.0
Shale, medium to dark gray.....	92.0	93.5
Five Point Formation:		
Limestone, cream, finely crystalline, contains brachiopods, crinoids.....	93.5	94.0
West Branch Formation:		
Shale, olive gray.....	94.0	98.0
Shale, pale red.....	98.0	98.4
Shale, greenish gray.....	98.4	100.0
Limestone, cream, very finely crystalline, contains glauconite.....	100.0	100.5
Shale, greenish gray.....	100.5	101.0
Shale, greenish gray, interbedded with pale red.....	101.0	104.0
Shale, greenish gray.....	104.0	105.0
Shale, light to medium gray.....	105.0	107.0

Test Hole #52-78

3N 13E 30aaaa

Richardson County

Location: NE corner sec. 30, T. 3 N., R. 13 E., 90 feet south of
north section line, and 15 feet west of east section line.
Ground elevation: 1,125.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil (no sample).....	0.0	2.0
Silt, reddish brown, clayey.....	2.0	7.0
Silt, reddish brown, sandy.....	7.0	12.0
Silt, brown, clayey, sandy.....	12.0	52.0
Silt, medium gray.....	52.0	62.0
Silt, brownish gray.....	62.0	67.0
Silt, light gray, sandy.....	67.0	72.0

Pennsylvanian System - Virgil Series - Wabaunsee Group:**Soldier Creek Formation:**

Shale, greenish gray, interbedded with olive.....	72.0	78.0
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Burlingame Formation:**South Fork Member:**

Limestone, light gray to cream, finely crystalline, porous, contains crinoids, interbedded with shale, red and green.....	78.0	85.0
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Winnebago Member:

Shale, brown.....	85.0	86.0
Shale, medium gray.....	86.0	92.0
Shale, medium to dark gray.....	92.0	97.0

Taylor Branch Member:

Limestone, dark gray, irregularly crystalline, contains algal material.....	97.0	98.0
Shale, medium gray.....	98.0	98.5
Limestone, light gray, very finely crystalline.....	98.5	99.3
Shale, medium gray.....	99.3	101.8
Limestone, light tannish gray, finely crystalline to dense.....	101.8	103.0

Scranton Formation:**Cedarvale - White Cloud Members:**

Shale, medium to light gray.....	103.0	107.0
Shale, medium gray, silty.....	107.0	112.0
Shale, medium gray, silty, interbedded with sandstone, gray, very fine grained.....	112.0	117.0
Shale, medium gray, silty.....	117.0	134.5
Shale, black.....	134.5	135.0
Shale, medium gray.....	135.0	139.7

Limestone, light greenish gray, very finely crystalline, interbedded with shale, greenish gray	139.7	150.0
Limestone, cream, irregularly crystalline, contains algal material.....	150.0	151.2
Shale, brownish olive.....	151.2	153.0
Shale, medium to dark gray.....	153.0	154.0
Limestone, bluish gray, irregularly crystalline, contains crinoids, fusulinids.....	154.0	155.5
Shale, medium gray.....	155.5	181.4
Shale, medium gray, interbedded with limestone, brown, dense, thin.....	181.4	197.0

Test Hole #50-78
3N 13E 32baaa
Richardson County

Location: NE corner NW sec. 32, T. 3 N., R. 13 E., 20 feet south of
north section line, and 2,560 feet east of west section line.
Ground elevation: 1,085.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Silt, reddish brown, clayey.....	2.0	7.0
Silt, pale brown, sandy.....	7.0	15.0
Sand, medium to coarse, gravelly, very fine to fine.	15.0	16.0
Clay, light brown.....	16.0	29.0
No sample (lost circulation).....	29.0	42.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Willard Formation:		
Shale, pale olive, interbedded with siltstone, olive	42.0	44.0
Shale, medium gray, silty.....	44.0	47.0
Shale, medium gray, mottled with olive.....	47.0	62.0
Shale, light gray.....	62.0	72.0
Emporia Formation:		
Elmont Member:		
Limestone, brownish gray, very finely crystalline, contains brachiopods, fusulinids, pyrite.....	72.0	74.3
Shale, light to medium gray.....	74.3	76.3
Claystone, light gray.....	76.3	77.0
Limestone, light tannish gray, very finely crystalline.....	77.0	77.5
Claystone, light greenish gray.....	77.5	78.5
Limestone, light gray, very finely crystalline.....	78.5	79.3
Harveyville Member:		
Shale, greenish gray.....	79.3	79.7
Shale, medium gray.....	79.7	81.3
Reading Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	81.3	84.5
Shale, medium gray.....	84.5	85.5
Limestone, light gray, irregularly crystalline, contains brachiopods, crinoids, pyrite.....	85.5	86.5
Auburn Formation:		
Shale, medium gray.....	86.5	88.0
Shale, greenish gray.....	88.0	91.3
Shale, dark reddish brown.....	91.3	94.0
Shale, reddish brown, mottled with green and brown..	94.0	95.3

Shale, greenish gray, interbedded with limestone, greenish brown, dense.....	95.3	102.0
Shale, light gray.....	102.0	107.0
Shale, medium gray.....	107.0	117.2
Wakarusa Formation:		
Limestone, light to medium gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids, pyrite, interbedded with shale, gray..	117.2	121.3
Soldier Creek Formation:		
Shale, light gray.....	121.3	128.0
Burlingame Formation:		
South Fork Member:		
Limestone, tan, very finely crystalline to dense....	128.0	129.0
Shale, light greenish gray.....	129.0	130.8
Limestone, cream, irregularly crystalline, contains <u>Osagia</u> , oolites, algal material.....	130.8	132.5
Winnebago Member:		
Shale, light greenish gray, interbedded with limestone, tan, dense.....	132.5	138.0
Taylor Branch Member:		
Limestone, medium to dark gray, very finely crystalline to dense, contains bryozoans.....	138.0	138.4
Shale, light gray.....	138.4	139.0
Limestone, medium gray, very finely crystalline to dense.....	139.0	141.0
Shale, light gray.....	141.0	147.0
Shale, medium gray.....	147.0	150.0
Limestone, dark gray, irregularly crystalline, contains algal material, brachiopods.....	150.0	152.0

Test Hole #39-78
3N 13E 33addd
Richardson County

Location: SE corner NE, sec. 33, T. 3 N., R. 13 E., 2,565 feet south
of north section line, and 10 feet west of east section line.
Ground elevation: 1,055.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill (no sample).....	0.0	4.0
Sand, very fine to medium, silty.....	4.0	7.0
Clay, brown, silty, sandy.....	7.0	20.0
Permian System - Big Blue Series - Council Grove Group:		
Shale, light gray, silty.....	20.0	25.0
Shale, light gray, mottled with olive.....	25.0	30.0
Shale, light gray, silty, interbedded with sandstone, brown, very fine grained.....	30.0	35.0
Shale, light gray, silty.....	35.0	46.7
Sandstone, light gray, very fine grained, lime cemented, interbedded with silt, gray.....	46.7	49.6
Shale, light gray, silty, interbedded with sandstone, gray, very fine grained.....	49.6	70.2
Sandstone, medium gray, fine to medium grained, contains black carbonaceous material.....	70.2	73.0
Coal, black.....	73.0	73.2
Shale, light gray.....	73.2	74.0
Shale, medium gray.....	74.0	79.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Maple Hill Member:		
Limestone, light to medium gray, irregularly crystalline, contains brachiopods, crinoids, fusulinids, pyrite.....	79.0	81.0
Wamego Member:		
Coal, black.....	81.0	82.0
Shale, light gray.....	82.0	86.0
Shale, light to medium gray.....	86.0	92.0

Test Hole #47-78
3N 13E 33aaaa
Richardson County

Location: NE corner sec. 33, T. 3 N., R. 13 E., 15 feet south of
north section line, and 80 feet west of east section line.
Ground elevation: 1,101.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	2.0
Silt, reddish brown, clayey, sandy.....	2.0	7.0
Silt, reddish brown, sandy.....	7.0	11.0
Sand, fine to very coarse, gravelly, very fine to medium, interbedded with silt, brown.....	11.0	16.0
Silt, light brown, clayey.....	16.0	26.0
Silt, light tan, clayey.....	26.0	62.5
Permian System - Big Blue Series - Council Grove Group:		
Shale, medium gray.....	62.5	67.0
Shale, medium gray, silty.....	67.0	70.9
Sandstone, light gray, very fine to fine grained, lime cemented, contains black carbonaceous material.....	70.9	72.0
Shale, light gray, silty.....	72.0	77.0
Shale, light gray, silty, interbedded with sandstone, gray, very fine grained.....	77.0	82.0
Shale, light gray, silty.....	82.0	116.0
Sandstone, light gray, very fine to fine grained, contains pyrite.....	116.0	116.4
Shale, light gray, silty.....	116.4	127.0
Shale, light gray, silty, contains trace of coal....	127.0	132.8
Sandstone, light gray, very fine to fine grained, lime cemented, contains pyrite.....	132.8	133.9
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Coal, black.....	133.9	134.8
Shale, light gray.....	134.8	137.0

Test Hole #37-78
3N 13E 34dccc
Richardson County

Location: SE SW SW SE sec. 34, T. 3 N., R. 13 E., 75 feet north of
 south section line, and 2,040 feet west of east section line.
 Ground elevation: 1,068.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:	0.0	4.0
Soil (no sample).....	4.0	7.0
Clay, light brown, silty.....	7.0	12.0
Clay, reddish brown, silty.....	12.0	17.5
Clay, yellowish olive, silty.....		
Permian System - Big Blue Series - Council Grove Group:		
Foraker Formation:		
Americus Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	17.5	18.0
Admire Group:		
Hamlin Formation:		
Oaks - Stine Members:	18.0	19.0
Shale, black.....	19.0	19.3
Shale, brownish olive.....	19.3	23.0
Shale, medium gray.....	23.0	24.0
Shale, light gray.....	24.0	29.0
Shale, light greenish gray.....		
Shale, light greenish gray, interbedded with pale red.....	29.0	32.0
Shale, light greenish gray, interbedded with siltstone, tan.....	32.0	36.0
Shale, light greenish gray.....	36.0	43.0
Shale, medium to dark gray.....	43.0	47.4
Limestone, light to medium gray, very finely crystalline, contains brachiopods.....	47.4	48.0
Shale, medium gray.....	48.0	50.5
Limestone, light to medium gray, very finely crystalline.....	50.5	52.2
Shale, greenish gray.....	52.2	54.0
Limestone, light gray, fine to very finely crystalline.....	54.0	54.5
Shale, gray, interbedded with greenish gray.....	54.5	58.0
Shale, olive.....	58.0	61.7
Shale, medium gray.....	61.7	62.4

Five Point Formation:

Limestone, white to light gray, irregularly crystalline, contains brachiopods, algal material.	62.4	67.0
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West Branch Formation:

Shale, light greenish gray, interbedded with claystone, gray.....	67.0	69.5
Shale, light greenish gray.....	69.5	75.0
Shale, light to medium gray.....	75.0	84.2

Falls City Formation:**Lehmer Member:**

Limestone, medium to dark gray, pebbly texture, porous.....	84.2	87.8
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Reserve Member:

Shale, medium to dark gray.....	87.8	92.0
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Miles Member:

Limestone, light to medium gray, irregularly crystalline, contains brachiopods, crinoids, algal material, black inclusions.....	92.0	93.2
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Onaga Formation:**Hauxby - Towle Members:**

Shale, light greenish gray, interbedded with pale red.....	93.2	97.0
Shale, light greenish gray.....	97.0	102.0
Shale, reddish brown.....	102.0	107.0

Test Hole #63-78
3N 13E 34bbcc
Richardson County

Location: SW SW NW NW sec. 34, T. 3 N., R. 13 E., 1,205 feet south of
north section line, and 20 feet east of west section line.
Ground elevation: 1,103.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	Depth, in feet	
	From	To
Quaternary System, undifferentiated:	0.0	2.0
Soil (no sample).....	2.0	7.0
Silt, reddish brown, clayey.....	7.0	11.0
Silt, yellowish brown, clayey.....	11.0	17.0
Silt, grayish brown.....	17.0	31.0
Silt, light brown.....		
Permian System - Big Blue Series - Council Grove Group:		
Limestone, brownish gray, irregularly crystalline, contains fossil fragments.....	31.0	32.0
Shale, reddish brown.....	32.0	35.0
Shale, pale olive.....	35.0	40.0
Limestone, yellowish brown, finely crystalline, contains brachiopods.....	40.0	41.2
Shale, olive gray.....	41.2	46.0
Shale, medium to light gray.....	46.0	62.0
Shale, medium gray, silty, sandy.....	62.0	114.2
Sandstone, medium gray, very fine grained.....	114.2	116.0
Shale, greenish gray, silty, limy.....	116.0	122.0
Shale, medium gray.....	122.0	127.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Zeandale Formation:		
Maple Hill Member:		
Limestone, dark gray, very finely crystalline, con- tains brachiopods, crinoids, fusulinids, pyrite...	127.5	128.5
Wamego Member:		
Coal, member.....	128.5	129.3
Sandstone, gray to greenish gray, very fine grained.	129.3	133.3
Shale, light gray, silty.....	133.3	146.1
Tarkio Member:		
Limestone, medium to dark gray, irregularly crystalline, pebbly, impure, contains fossil fragments.....	146.1	146.7
Shale, greenish gray, interbedded with limestone, tan, dense.....	146.7	149.2
Willard Formation:		
Shale, light gray to greenish gray, silty, sandy, limy.....	152.0	157.0

Shale, medium gray, silty.....	157.0	183.4
Emporia Formation:		
Elmont Member:		
Limestone, medium gray to tannish gray, irregularly to very finely crystalline, contains brachiopods, crinoids.....	183.4	185.5
Shale, medium gray.....	185.5	188.0
Limestone, light greenish gray to tannish gray, very finely crystalline.....	188.0	190.2
Harveyville Member:		
Shale, dark greenish gray.....	190.2	193.8
Reading Member:		
Limestone, medium gray, very finely crystalline, contains brachiopods, crinoids.....	193.8	196.5
Shale, dark gray.....	196.5	197.8
Limestone, medium gray, irregularly crystalline, contains brachiopods.....	197.8	198.2
Auburn Formation:		
Shale, medium gray, interbedded with greenish gray, limy.....	198.2	201.0
Shale, reddish brown.....	201.0	205.0

Test Hole #36-78
3N 13E 35CDDD
Richardson County

Location: SE corner SW sec. 35, T. 3 N., R. 13 E., 85 feet north of
 south section line, and 2,515 feet east of west section line.
 Ground elevation: 1,071.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Clay, yellowish brown, silty, sandy.....	0.0	2.5
Permian System - Big Blue Series - Admire Group:		
Hamlin Formation:		
Stine Member:		
Limestone, dark brown, irregularly crystalline.....	2.5	3.0
Shale, light gray.....	3.0	4.0
Limestone, light tannish gray, very finely crystalline.....	4.0	4.3
Shale, light greenish gray.....	4.3	5.0
Shale, light gray.....	5.0	6.0
Limestone, light gray, very finely crystalline, contains fossil fragments.....	6.0	6.2
Shale, olive, mottled with gray and brown.....	6.2	9.5
Limestone, pale yellow, irregularly crystalline, contains algal material.....	9.5	9.6
Shale, gray, mottled with red, brown, olive.....	9.6	13.2
Five Point Formation:		
Limestone, cream, irregularly crystalline, contains brachiopods, algal material.....	13.2	14.1
West Branch Formation:		
Shale, olive gray.....	14.1	15.5
Shale, medium gray.....	15.5	18.0
Shale, greenish gray.....	18.0	21.0
Shale, pale reddish brown.....	21.0	21.5
Shale, light greenish gray, limy.....	21.5	25.4
Shale, dark gray.....	25.4	27.2
Shale, light gray, limy.....	27.2	30.0
Shale, dark gray.....	30.0	31.0
Shale, medium gray.....	31.0	34.7
Falls City Formation:		
Lehmer Member:		
Limestone, light and medium gray, irregularly to very finely crystalline, contains pelecypods.....	34.7	37.5
Reserve Member:		
Shale, dark gray.....	37.5	41.2

Miles Member:		
Limestone, light to medium gray, irregularly crystalline, contains brachiopods.....	41.2	41.8
Onaga Formation:		
Hauxby - Towle Members:		
Shale, light greenish gray.....	41.8	47.0
Shale, light greenish gray, interbedded with pale red.....	47.0	52.0
Shale, light greenish gray to light gray.....	52.0	54.0
Shale, reddish brown.....	54.0	58.0
Shale, greenish gray, mottled with olive.....	58.0	59.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light greenish gray and yellow, very finely crystalline, contains brachiopods and glauconite.....	59.5	61.3
Pony Creek - Plumb Members:		
Shale, olive, mottled with green and gray.....	61.3	68.0
Shale, reddish brown.....	68.0	76.0
Shale, olive.....	76.0	76.5
Shale, light to medium gray.....	76.5	79.0
Nebraska City Member:		
Limestone, medium to dark gray, finely crystalline, impure, contains brachiopods.....	79.0	80.2
Root Formation:		
French Creek Member:		
Shale, light gray.....	80.2	80.7
Coal, black.....	80.7	81.2
Shale, light gray.....	81.2	85.0
Coal, black.....	85.0	85.3
Shale, light greenish gray.....	85.3	86.0
Shale, light gray, silty.....	86.0	92.0

Test Hole #42-78
3N 13E 35baaa
Richardson County

Location: NE corner NW sec. 35, T. 3 N., R. 13 E., 15 feet south of
north section line, and 2,695 feet west of east section line.
Ground elevation: 1,112.0 ft (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	5.0
Silt, yellowish brown, silty, sandy.....	5.0	10.0
Sandstone, yellowish brown, very fine grained, highly weathered.....	10.0	15.3
Permian System - Big Blue Series - Council Grove Group:		
Foraker Formation:		
Long Creek Member:		
Limestone, yellow, irregularly crystalline, porous, vuggy.....	15.3	16.0
Silt, yellow.....	16.0	19.5
Limestone, pale yellow, very finely crystalline.....	19.5	20.0
Hughes Creek Member:		
Shale, light gray.....	20.0	25.0
Shale, medium gray.....	25.0	29.5
Shale, light gray.....	29.5	33.0
Limestone, medium to dark gray, finely crystalline, contains brachiopods.....	33.0	33.6
Shale, black.....	33.6	36.0
Limestone, light to medium gray, finely to very finely crystalline, contains brachiopods.....	36.0	37.0
Shale, light gray.....	37.0	40.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	40.0	40.4
Shale, light gray.....	40.4	42.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	42.0	42.6
Shale, light gray.....	42.6	43.5
Limestone, medium gray, finely crystalline, contains brachiopods.....	43.5	44.9
Shale, dark gray.....	44.9	49.0
Limestone, bluish gray, irregularly crystalline, pebbly texture, contains brachiopods, algal material.....	49.0	51.0
Shale, medium to dark gray.....	51.0	56.0
Shale, dark gray.....	56.0	59.0

Americus Member:		
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	59.0	60.2
Shale, black.....	60.2	61.0
Limestone, medium gray, irregularly crystalline, contains brachiopods, algal material.....	61.0	61.2
Admire Group:		
Hamlin Formation:		
Oaks Members:		
Shale, medium gray.....	61.2	65.0
Shale, greenish gray.....	65.0	69.5
Shale, light gray, interbedded with pale red.....	69.5	72.0
Shale, light greenish gray.....	72.0	76.0
Houchens Creek Member:		
Limestone, tannish gray, very finely crystalline....	76.0	77.0
Stine Member:		
Shale, light gray to greenish gray, silty.....	77.0	80.0
Shale, medium gray.....	80.0	87.0
Shale, dark gray.....	87.0	88.0
Shale, light gray, limy.....	88.0	90.0
Shale, medium gray, silty.....	90.0	92.0
Shale, light gray, limy.....	92.0	94.5
Gypsum, white.....	94.5	95.8
Shale, light gray to greenish gray.....	95.8	98.0
Shale, olive.....	98.0	100.0
Shale, medium gray.....	100.0	102.0
Five Point Formation:		
Limestone, cream, irregularly crystalline, contains brachiopods, algal material.....	102.0	104.0
West Branch Formation:		
Shale, light gray.....	104.0	108.0
Shale, greenish gray.....	108.0	109.0
Shale, light greenish gray, interbedded with pale red, limy.....	109.0	114.0
Shale, dark gray to black.....	114.0	115.0
Shale, light gray, limy.....	115.0	120.0
Shale, light gray.....	120.0	123.0
Falls City Formation:		
Lehmer Member:		
Limestone, gray, very finely crystalline, oolitic...	123.0	126.0
Reserve Member:		
Shale, light to medium gray.....	126.0	130.0
Miles Member:		
Limestone, bluish gray, finely crystalline, pebbly texture, contains black inclusions.....	130.0	132.0
Onaga Formation:		
Hauxby - Towle Members:		
Shale, greenish gray.....	132.0	135.0

Shale, medium gray, interbedded with pale red.....	135.0	137.0
Shale, light gray, interbedded with greenish gray, limy.....	137.0	139.0
Limestone, cream, very finely crystalline.....	139.0	140.0
Shale, reddish brown.....	140.0	145.5
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, pale yellowish gray, finely to very finely crystalline, contains brachiopods, crinoids	145.5	147.5
Pony Creek - Plumb Members:		
Shale, light gray.....	147.5	148.0
Shale, olive.....	148.0	149.5
Shale, light gray, mottled with red.....	149.5	150.0
Shale, light greenish gray.....	150.0	152.0

Test Hole #43-78
3N 13E 35cbcb
Richardson County

Location: NW SW NW SW sec. 35, T. 3 N., R. 13 E., 1,700 feet north of
 south section line, and 20 feet east of west section line.
 Ground elevation: 1,110.0 ft (Humboldt 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	1.0
Permian System -Big Blue Series - Council Grove Group:		
Foraker Formation:		
Long Creek Member:		
Limestone, yellow, very finely to irregularly crystalline, porous, vuggy.....	1.0	2.0
Shale, yellow.....	2.0	6.0
Limestone, pale yellow, irregularly crystalline.....	6.0	7.5
Hughes Creek Member:		
Shale, yellow brown.....	7.5	10.0
Shale, olive yellow.....	10.0	14.0
Shale, medium gray.....	14.0	17.0
Shale, olive.....	17.0	21.2
Limestone, medium to dark gray, very finely crystalline, contains brachiopods.....	21.2	21.7
Shale, black.....	21.7	23.0
Shale, medium gray.....	23.0	24.0
Limestone, light to medium gray, fine crystalline, contains brachiopods.....	24.0	26.0
Shale, medium gray.....	26.0	28.5
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids.....	28.5	29.5
Shale, medium gray.....	29.5	32.0
Limestone, medium gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	32.0	33.0
Shale, light gray, limy.....	33.0	35.0
Shale, medium to dark gray.....	35.0	39.0
Limestone, bluish gray, finely crystalline, contains brachiopods, crinoids, fusulinids.....	39.0	41.0
Shale, medium to dark gray.....	41.0	48.4
Americus Member:		
Limestone, bluish gray, irregularly crystalline, contains brachiopods, crinoids, algal material....	48.4	49.1
Shale, black.....	49.1	50.0
Limestone, dark gray, finely crystalline, contains brachiopods, crinoids.....	50.0	50.1

Admire Group:

Hamlin Formation:

Oaks - Stine Members:

Shale, medium gray.....	50.1	54.0
Shale, greenish gray.....	54.0	58.0
Shale, greenish gray, interbedded with pale red.....	58.0	61.0
Shale, greenish gray, interbedded with limestone, tan, dense.....	61.0	66.0
Shale, light greenish gray, silty.....	66.0	70.0
Shale, light to medium gray.....	70.0	74.0
Shale, medium to dark gray.....	74.0	78.0
Limestone, light brownish gray, very finely crystalline.....	78.0	78.4
Shale, light greenish gray.....	78.4	81.0
Limestone, light brownish gray, very finely crystalline.....	81.0	82.3
Shale, light greenish gray.....	82.3	83.7
Limestone, light tannish gray, very finely crystalline, contains fossil fragments.....	83.7	84.1
Shale, light greenish gray.....	84.1	84.6
Shale, medium gray.....	84.6	85.0
Shale, greenish gray, mottled with olive.....	85.0	87.0
Limestone, cream, irregularly crystalline.....	87.0	89.0
Shale, pale reddish brown.....	89.0	91.0
Shale, dark gray.....	91.0	92.0

Test Hole #48-78
3N 13E 35aaaa
Richardson County

Location: NE corner sec. 35, T. 3 N., R. 13 E., 15 feet south of
north section line, and 190 feet west of east section line.
Ground elevation: 1,153.0 (Humboldt 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil (no sample).....	0.0	3.0
Sand, very fine to very coarse, gravelly, very fine to medium.....	3.0	22.0
Sand, very fine to fine, silty.....	22.0	32.0
Silt, yellowish brown, sandy.....	32.0	48.0
Silt, medium gray, yellowish brown, sandy.....	48.0	55.0
Permian System - Big Blue Series - Council Grove Group:		
Crouse Formation:		
Limestone, cream, irregularly crystalline, contains brachiopods, algal material.....	55.0	56.7
Easley Creek Formation:		
Shale, light gray, silty.....	56.7	60.0
Shale, light olive gray.....	60.0	63.0
Shale, reddish brown.....	63.0	64.0
Shale, light greenish gray.....	64.0	64.5
Shale, reddish brown.....	64.5	66.0
Shale, greenish gray.....	66.0	66.5
Shale, reddish brown.....	66.5	70.0
Shale, olive gray, silty.....	70.0	72.0
Bader Formation:		
Middleburg Member:		
Limestone, yellow, very fine to coarsely crystalline, porous.....	72.0	74.0
Hooser Member:		
Shale, light gray to olive gray.....	74.0	77.0
Shale, white to light gray, interbedded with sandstone, light gray, very fine grained.....	77.0	79.0
Shale, gray, interbedded with green, red, olive.....	79.0	84.9
Eiss Member:		
Limestone, white, very finely crystalline, porous...	84.9	87.3
Shale, light olive.....	87.3	89.0
Shale, medium gray.....	89.0	94.5
Limestone, medium gray, finely to very finely crystalline, contains brachiopods.....	94.5	96.3
Stearns Formation:		
Shale, light gray and greenish gray.....	96.3	102.0

Shale, reddish brown.....	102.0	105.0
Shale, cream, limy.....	105.0	108.0
Beattie Formation:		
Morrill - Florena Members:		
Limestone, light tannish gray, very finely crystalline.....	108.0	108.6
Shale, light gray to white.....	108.6	109.0
Limestone, light tannish gray, very finely crystalline, contains gypsum.....	109.0	111.0
Cottonwood Member:		
Limestone, cream to light gray, finely to irregularly crystalline, contains fusulinids.....	111.0	122.5
Eskridge Formation:		
Shale, pale red, interbedded with gray.....	122.5	128.0
Shale, greenish gray.....	128.0	137.0

Test Hole #18-B-67
3N 14E 6bbaa
Richardson County

Location: NE NE NW NW sec. 6, T. 3 N., R. 14 E., 7.5 feet south and
 696 feet east of northwest corner.

Ground elevation: 1,095.0 feet (t) (Howe SW 7.5 min. quadrangle)

Depth to water: 25.40 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	2.5
Silt, very clayey, slightly sandy, pale yellow, sand is very fine, below 8.0 ft. sand is very fine to fine.....	2.5	10.0
Silt, slightly clayey, moderately sandy, yellowish brown, sand is very fine to medium, from 15.0 - 19.3 ft. sand is very fine to fine, below 20.0 ft. sand is very fine to coarse, with some gravel below 23.5 ft.....	10.0	26.0
Silt, very sandy, slightly clayey, yellowish brown, sand is very fine to medium, from 27.0 - 29.7 ft. some gravel.....	26.0	30.0
Silt, moderately to very sandy, slightly clayey, grayish brown, sand is very fine to medium, below 31.0 ft. yellowish brown, from 31.0 - 35.0 ft. sand is very fine to coarse.....	30.0	36.5
Silt, moderately sandy, slightly clayey, brownish yellow, sand is very fine to fine, below 36.5 ft. pale brown.....	36.5	37.5
Silt, moderately clayey, slightly sandy, light gray, sand is very fine to fine, from 40.0 - 41.4 ft. pale olive.....	37.5	43.0
Sand, gravelly, fine sand to medium gravel, some pebbles below 45.0 ft.....	43.0	50.0
Sand, very fine to very coarse.....	50.0	54.0
Silt, very sandy, slightly clayey, slightly calcar- eous, olive gray, sand is very fine to medium.....	54.0	55.0
Silt, very sandy, slightly clayey, slightly calcareous, dark gray, sand is very fine to medium, below 58.0 ft. moderately calcareous, gray	55.0	66.9
Silt, moderately clayey, slightly sandy, slightly calcareous, gray, sand is very fine to medium, below 67.8 ft. slightly gravelly.....	66.9	69.5
Silt, very clayey, slightly sandy, moderately calcareous, gray, sand is very fine to medium.....	69.5	73.0
Sand, slightly gravelly, fine.....	73.0	75.0
Gravel, sandy, coarse sand to medium gravel.....	75.0	80.0

Silt, moderately sandy, slightly clayey, slightly calcareous, pale yellow, sand is very fine to fine, from 80.0 - 85.0 ft. gray, below 85.0 ft. light olive gray.....	80.0	88.0
Sand, very fine to very coarse, some fine gravel....	88.0	96.0
Silt, moderately sandy, slightly clayey, slightly calcareous, gray, sand is very fine to fine, from 100.0 - 105.0 ft. pale olive, in places the sand is very fine to medium.....	96.0	152.0
Silt, moderately sandy, slightly clayey, slightly calcareous, gray, sand is very fine to coarse, below 153.0 ft. sand is very fine to fine, below 169.8 ft. moderately clayey.....	152.0	177.0
Gravel, sandy, medium sand to coarse gravel.....	177.0	179.3
Permian System - Big Blue Series - Council Grove Group:		
Red Eagle Formation:		
Bennett Member:		
Shale, very light gray.....	179.3	182.8
Shale, dark gray, black carbonaceous.....	182.8	182.9
Shale, light to medium gray.....	182.9	184.2
Shale, black carbonaceous.....	184.2	185.0
Shale, black carbonaceous, contains abundant pyrite.	185.0	186.0
No sample, stem dropped.....	186.0	186.5
Shale, black carbonaceous.....	186.5	189.0
Glenrock Member:		
Limestone, medium grayish brown, finely crystalline, contains fusulinids.....	189.0	189.5
Johnson Formation:		
Shale, light greenish gray, interbedded with light gray, very finely crystalline limestone.....	189.5	190.5
Shale, light greenish gray, interbedded with greenish gray limestone.....	190.5	192.8
Shale, light greenish gray.....	192.8	198.0
Limestone, light gray, very finely crystalline, interbedded with greenish gray shale.....	198.0	198.4
Shale, light greenish gray, silty.....	198.4	202.1
Shale, light greenish gray, interbedded with light greenish gray siltstone.....	202.1	202.7
Shale, light greenish gray, interbedded with white gypsum.....	202.7	203.0
Shale, medium gray, interbedded with white gypsum...	203.0	203.2
Shale, light greenish gray, interbedded with white gypsum.....	203.2	205.5
Shale, light greenish gray.....	205.5	206.5
Gypsum, white.....	206.5	216.4

Foraker Formation:**Long Creek Member:**

Dolomite Limestone, light brownish gray, very finely crystalline.....	216.4	217.0
Gypsum, white.....	217.0	218.1
Dolomite Limestone, light brownish gray, very finely crystalline, interbedded with shale and gypsum....	218.1	218.7
Dolomite Limestone, light brownish gray, very finely crystalline, interbedded with shale.....	218.7	219.6
Dolomite Limestone, light brownish gray, interbedded with shale, light greenish gray and gypsum.....	219.6	220.2
Gypsum, white, interbedded with dolomite limestone..	220.2	221.8
Shale, very light gray, interbedded with gypsum.....	221.8	222.8
Shale, very light gray, interbedded with light tan, very finely crystalline limestone.....	222.8	224.4
Limestone, light tan, very finely crystalline, interbedded with shale.....	224.4	225.9
Shale, light gray, with some interbedded gypsum.....	225.9	226.3
Limestone, light gray, very finely crystalline, interbedded with shale.....	226.3	227.2

Hughes Creek Member:

Shale, light gray.....	227.2	229.2
Shale, light gray, interbedded with light gray limestone.....	229.2	230.2
Shale, medium gray, clayey, contains fossil fragments.....	230.2	231.5
Shale, medium to dark gray, with some interbedded gypsum.....	231.5	235.6
Shale, light greenish gray, contains brachiopods and pyrite.....	235.6	239.3
Shale, light greenish gray, trace of limestone.....	239.3	240.2
Shale, black carbonaceous, dark gray.....	240.2	240.4
Shale, black carbonaceous.....	240.4	242.4
Shale, light gray, with some interbedded gypsum.....	242.4	242.8
Limestone, medium gray, impure, contains brachiopod fragments.....	242.8	243.4
Limestone, medium gray, interbedded with light greenish gray shale.....	243.4	244.5
Shale, medium gray, with interbedded gypsum.....	244.5	247.6
Shale, light to medium gray, with some interbedded limestone.....	247.6	250.5

Test Hole #28-B-67

3N 14E 6cccb

Richardson County

Location: NW SW SW SW sec. 6, T. 3 N., R. 14 E., 372.5 feet north and 3.5 feet east of southwest corner.

Ground elevation: 1,124.0 feet (t) (Humboldt 7.5 min. quadrangle)

Depth to water: 46.98 feet

Depth, in feet
From To

Quaternary System, undifferentiated:

Top soil, brownish black.....	0.0	0.5
Clay, silty, olive gray, below 1.1 ft. slightly sandy, pale olive, sand is very fine to fine.....	0.5	4.5
Silt, moderately clayey, moderately sandy, pale olive, sand is very fine to fine, from 7.0 - 8.5 ft. olive gray.....	4.5	10.0
Till, clayey, silty, sandy, gravelly, yellowish brown, from 12.8 - 16.5 ft. reddish yellow, below 16.5 ft. brownish yellow.....	10.0	17.0
Till, clayey, silty, sandy, gravelly, light olive gray, some reddish brown mottling, below 20.0 ft. slightly to moderately calcareous.....	17.0	34.0
Till, clayey, silty, sandy, gravelly, slightly calcareous, in part moderately calcareous, pale olive, from 35.0 - 37.5 ft. gray with some black, from 39.5 - 40.0 ft. light olive gray.....	34.0	42.5
Till, clayey, silty, sandy, gravelly, moderately calcareous, from 43.3 - 43.7 ft. olive, below 43.7 ft. brownish yellow.....	42.5	44.2
Till, clayey, silty, sandy, gravelly, moderately calcareous, pale olive, from 45.0 - 45.5 ft. slightly calcareous, some gray.....	44.2	48.3
Till, clayey, silty, sandy, few pebbles, moderately calcareous, olive, below 48.3 ft. some gray and olive yellow with some red, brown, and black mottling.....	48.3	56.5
Sand, slightly gravelly, fine sand to fine gravel, trace of coarse gravel, below 80.0 ft. no coarse gravel.....	56.5	100.0
Sand, gravelly, fine sand to fine gravel, some medium gravel, below 105.0 ft. trace of coarse gravel.....	100.0	108.0
Gravel, sandy, fine sand to very coarse gravel.....	108.0	115.0
Sand and gravel, medium sand to very coarse gravel..	115.0	120.0
Gravel, sandy, coarse sand to coarse gravel.....	120.0	122.2

Permian System - Big Blue Series - Council Grove Group:

Eskridge Formation:

Limestone, brownish yellow, coarsely crystalline....	122.2	122.5
Shale, pale reddish gray.....	122.5	125.0
Shale, light greenish gray, red stain in part.....	125.0	128.0

Grenola Formation:

Neva Member:

Limestone, light gray, mottled with red and green, soft, interbedded with light green and pale red shale.....	128.0	129.5
No sample, stem dropped, lost circulation.....	129.5	130.0

Test Hole #17-U-40
3N 14E 8ccda
Richardson County

Location: NE SE SW SW sec. 8, T. 3 N., R. 14 E., 1,320 feet east
 and 450 feet north of southwest corner of section.
 Ground elevation: 1,105.0 feet (t) (Dawson 7.5 min. quadrangle)
 Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	2.0
Clay, sandy, brown.....	2.0	16.0
Clay, sandy, slightly gravelly, fine to coarse, yellows and browns, contains chalklike material below 64.0 ft.....	16.0	88.0
Clay, sandy, silty, light gray, slightly gravelly...	88.0	102.0
Sand, fine, slightly gravelly, clayey, brown.....	102.0	106.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, grayish brown.....	106.0	106.9
Shale, light blue.....	106.9	109.0
Shale, hard, blue to black.....	109.0	110.0
Limestone, gray.....	110.0	111.0
Shale, blue, tan, brown.....	111.0	114.0
Limestone, gray.....	114.0	115.1
Shale, blue to brown.....	115.1	115.5
Limestone.....	115.5	116.0

Test Hole #12-U-40
3N 14E 19dada
Richardson County

Location: NE SE NE SE sec. 19, T. 3 N., R. 14 E., 1,848 feet north of
southeast corner of the section.

Ground elevation: 1,140.0 feet (t) (Humboldt 7.5 min. quadrangle)

Depth to water: not measured

Depth, in feet
From To

Quaternary System, undifferentiated:

Soil, clayey, gray to buff.....	0.0	9.5
Clay, sandy, brown.....	9.5	13.0
Sand, clayey, reddish brown and light tan.....	13.0	41.0
Clay, gray, slightly sandy and gravelly.....	41.0	45.0
Gravel, medium.....	45.0	47.0
Clay, sandy, gray to light blue.....	47.0	51.0

Permian System - Big Blue Series - Council Grove Group:

Shale, pinkish gray.....	51.0	52.0
Limestone, yellowish white.....	52.0	

Test Hole #150-40
3N 14E 24ddaa
Richardson County

Location: NE NE SE SE sec. 24, T. 3 N., R. 14 E., on west edge of
road, 1,108 feet north of the southeast corner of section.
Ground elevation: 975.0 feet (t) (Dawson 7.5 min. quadrangle)
Depth to water: 5.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, clayey, black.....	0.0	5.0
Clay, brownish gray.....	5.0	10.0
Clay, silty, dark greenish gray.....	10.0	35.0
Gravel, multi-colored, coarse.....	35.0	40.0
Sand and gravel, reddish brown, fine to medium.....	40.0	59.5
Gravel, yellow, medium, contains limestone chips, gray.....	59.5	73.0
Permian System - Big Blue Series - Admire Group:		
Shale, buff.....	73.0	76.0

Test Hole #40-79
3N 14E 34baaa
Richardson County

Location: NE NE NE NW sec. 34, T. 3 N., R. 14 E. 19 feet south of
north section line, and 195 feet west of half section line.
Ground elevation: 1,051.0 feet (Dawson 7.5 min. quadrangle)
Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Silt, dark gray.....	0.0	2.0
Silt, clayey, medium brown.....	2.0	8.0
Silt, light to medium tan, with iron staining, clayey.....	8.0	12.0
Silt, clayey, reddish brown, slightly sandy, very fine to coarse, slightly gravelly, fine.....	12.0	39.0
Permian System - Big Blue Series - Council Grove Group:		
Grenola Formation:		
Neva Member:		
Limestone, light yellowish brown, finely crystalline, weathered, contains abundant algal material.....	39.0	41.0
Salem Point - Sallyards Members:		
Shale (no sample, circulation lost).....	41.0	43.0
No sample taken (circulation lost).....	43.0	57.0
Roca Formation:		
No sample taken (circulation lost).....	57.0	60.0
Shale, reddish brown.....	60.0	61.0
Shale, medium gray.....	61.0	66.0
Shale, light gray, interbedded with thin limestone, light gray, finely crystalline.....	66.0	67.5
Shale, light gray.....	67.5	70.4
Shale, light yellowish tan.....	70.4	71.5
Limestone, light to medium olive gray, very finely crystalline, interbedded with shale, light tan....	71.5	72.5
Shale, light to medium tan.....	72.5	73.5
Shale, olive.....	73.5	77.0
Shale, light olive tan.....	77.0	84.0
Red Eagle Formation:		
Howe Member:		
Shale, light to medium olive.....	84.0	85.0
Bennett Member:		
Shale, dark gray, hard.....	85.0	88.2
Shale, medium to dark gray.....	88.2	90.0
Shale, black, contains carbonaceous material.....	90.0	94.8
Glenrock Member:		
Limestone, medium to dark gray, finely crystalline..	94.8	95.6

Johnson Formation:		
Shale, medium gray.....	95.6	107.0
Shale, medium to dark gray.....	107.0	113.7
Foraker Formation:		
Long Creek Member:		
Shale, medium gray, with olive tint, interbedded with siltstone, medium gray.....	113.7	115.3
Shale, light to medium gray.....	115.3	116.3
Shale, olive, interbedded with limestone, medium gray, finely crystalline, contains brachiopods....	116.3	117.3
Shale, light to medium gray, with olive tint.....	117.3	119.0
Shale, medium gray, interbedded with limestone, medium gray, finely crystalline, contains crinoids and sponge spicules.....	119.0	121.0
Hughes Creek Member:		
Shale, medium to dark gray.....	121.0	122.0
Shale, medium gray, contains trace of gypsum at 124.0 - 127.0 ft.....	122.0	127.0
Shale, dark gray, contains gypsum.....	127.0	129.6
Shale, medium gray, olive, contains trace of gypsum from 129.6 - 131.0 ft.....	129.6	133.5
Shale, black, contains carbonaceous material.....	133.5	136.5
Limestone, medium gray, finely crystalline, shaly, contains abundant fusulinids, brachiopods.....	136.5	137.0
Shale, medium to dark gray, limy at 142.4, 145.0 ft.	137.0	145.3
Shale, medium to dark olive gray.....	145.3	148.3
Limestone, dark gray, finely crystalline, contains crinoids, brachiopods, pyrite.....	148.3	148.9
Shale, dark gray.....	148.9	152.5
Limestone, dark gray, finely crystalline, impure, contains brachiopods, ostracods, crinoids, interbedded with shale, dark gray.....	152.5	154.0
Shale, medium to dark gray.....	154.0	161.5
Shale, medium to olive gray.....	161.5	161.8
Shale, medium gray, limy.....	161.8	164.6
Americus Member:		
Limestone, medium to dark gray, finely crystalline, contains crinoids, brachiopods, bryozoans, pyrite.	164.6	165.0
Shale, black.....	165.0	166.0
Limestone, medium gray, finely crystalline, contains brachiopods, pyrite, foraminifera.....	166.0	166.5
Admire Group:		
Hamlin Formation:		
Oaks Member:		
Shale, dark gray.....	166.5	168.4
Shale, light gray, limy.....	168.4	170.0
Shale, light to medium gray, with bluish tint.....	170.0	175.0
Shale, medium gray.....	175.0	178.1

Shale, light greenish gray.....	178.1	180.5
Houchens Creek Member:		
Limestone, light tan, finely crystalline.....	180.5	181.0
Shale, light greenish gray.....	181.0	181.5
Limestone, light tan, finely crystalline.....	181.5	182.2
Stine Member:		
Shale, light olive gray, interbedded with limestone, medium brown, finely crystalline.....	182.2	183.2
Shale, light gray.....	183.2	184.0
Shale, medium to dark olive gray.....	184.0	194.0
Limestone, medium gray, finely crystalline, contains foraminifera, quartz filled vugs.....	194.0	196.0
Shale, medium gray.....	196.0	198.0
Limestone, medium gray, very finely crystalline, contains pyrite.....	198.0	199.3
Shale, dark gray.....	199.3	201.8
Shale, light greenish gray, interbedded with limestone, light greenish gray, contains foraminifera, quartz filled vugs.....	201.8	202.8
Shale, light to medium olive.....	202.8	205.0
Shale, olive.....	205.0	209.0
Shale, dark gray.....	209.0	210.6
Five Point Formation:		
Limestone, light to medium gray, with tannish tint, very finely crystalline, contains foraminifera, abundant brachiopods.....	210.6	211.3
West Branch Formation:		
Shale, medium gray.....	211.3	212.0
Shale, medium to dark gray.....	212.0	218.0
Shale, medium bluish gray, limy.....	218.0	220.0
Limestone, light gray, very finely crystalline, shaly.....	220.0	223.3
Limestone, light gray, very finely crystalline, contains quartz filled vugs, interbedded with shale, light bluish gray.....	223.3	225.0
Shale, dark gray.....	225.0	226.0
Limestone, medium gray, very finely crystalline, shaly.....	226.0	227.0
Shale, dark gray.....	227.0	233.0
Falls City Formation:		
Lehmer Member:		
Limestone, medium to dark gray, finely crystalline, impure, contains gastropods, pyrite, abundant very small shell fragments (immature brachiopods or ostracods).....	233.0	234.1
Limestone, medium gray, finely crystalline, impure, contains pyrite, interbedded with shale, medium gray.....	234.1	236.0

Reserve Member:		
Shale, medium gray.....	236.0	239.4
Shale, dark gray.....	239.4	243.0
Miles Member:		
Limestone, medium gray, finely crystalline, contains foraminifera, dark gray "pelletoid" inclusions....	243.0	243.6
Onaga Formation:		
Hauxby - Towle Members:		
Shale, light to medium bluish gray.....	243.6	247.5
Shale, light to medium gray.....	247.5	254.4
Shale, light gray, with greenish tint.....	254.4	255.0
Shale, light bluish gray.....	255.0	256.5
Shale, medium reddish brown, interbedded with siltstone, medium greenish gray.....	256.5	260.0
Shale, medium reddish brown.....	260.0	265.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville - Plumb Members:		
Shale, medium gray, with olive, tint, interbedded with sandstone, medium gray to tan, very finely grained.....	265.0	271.0
Shale, medium gray.....	271.0	289.5
Nebraska City Member:		
Shale, light to medium gray, interbedded with limestone, medium tan, very finely crystalline, contains brachiopods, pyrite, bryozoans.....	289.5	290.7
Root Formation:		
French Creek Member:		
Shale, medium gray.....	290.7	291.7
Coal, black.....	291.7	292.2
Shale, medium gray.....	292.2	295.8
Coal, black.....	295.8	296.3
Shale, medium gray.....	296.3	297.8
Shale, light to medium greenish gray.....	297.8	299.1
Shale, light gray, with olive tint.....	299.1	302.0
Shale, light gray.....	302.0	305.2
Shale, medium to dark gray.....	305.2	309.0
Jim Creek Member:		
Shale, medium gray, limy.....	309.0	310.0
Friedrich Member:		
Shale, medium olive gray.....	310.0	313.5
Shale, medium gray.....	313.5	320.5
Shale, light gray.....	320.5	321.5
Stotler Formation:		
Grandhaven Member:		
Shale, light gray, with reddish tint.....	321.5	323.0
Dry Member:		
Shale, light gray.....	323.0	334.5

Shale, reddish brown, limy, interbedded with limestone, light to medium cream, very finely crystalline.....	334.5	341.0
Shale, medium gray.....	341.0	370.0
Dover Member:		
Shale, medium gray, limy.....	370.0	372.0
Pillsbury Formation:		
Shale, medium reddish olive.....	372.0	377.0
Shale, medium gray.....	377.0	389.0
Zeandale Formation:		
Maple Hill Member:		
Shale, medium gray.....	389.0	391.0
Wamego Member:		
Shale, dark gray to black.....	391.0	392.0
Shale, medium gray.....	392.0	397.0
Shale, olive.....	397.0	398.5
Shale, reddish olive.....	398.5	402.0
Shale, light greenish gray.....	402.0	404.0
Tarkio Member:		
Limestone, light cream to gray, finely crystalline, impure, contains fusulinids, algal material, pyrite, interbedded with shale, medium olive gray	404.0	407.0
Limestone, light gray to white, very finely crystalline, contains brachiopods, algal material, crinoids, fusulinids.....	407.0	409.5
Willard Formation:		
Shale, light olive tan.....	409.5	410.7
Shale, dark gray, with reddish brown.....	410.7	413.5
Shale, light to medium gray, interbedded with limestone, light gray to white, finely crystalline, contains fusulinids, pelecypods, pyrite.....	413.5	416.3
Shale, light to medium greenish gray.....	416.3	417.8
Shale, medium greenish gray.....	417.8	418.1
Shale, medium to dark gray.....	418.1	437.0
No sample (probable shale).....	437.0	441.0
Emporia Formation:		
Elmont - Reading Members:		
No sample (probable limestone).....	441.0	444.0
Shale, medium gray.....	444.0	447.2
Limestone, medium gray, with brownish tint, finely crystalline, contains brachiopods, crinoids, pyrite, chert, interbedded with shale, medium gray	447.2	448.0
Shale, medium to dark gray, limy.....	448.0	449.0
Limestone, light gray to cream, very finely crystalline, contains brachiopods, interbedded with shale, very light to light gray.....	449.0	450.3
Shale, medium gray.....	450.3	451.0
Shale, medium to dark gray.....	451.0	452.0

Shale, medium gray, limy.....	452.0	456.0
Limestone, light gray, mottled with dark gray and light tan, finely crystalline, shaly, contains crinoids, pyrite.....	456.0	458.2
Shale, medium gray.....	458.2	458.5
Limestone, light tan, light gray, finely crystalline	458.5	459.0
Auburn Formation:		
Shale, medium gray.....	459.0	460.0
Shale, light to medium greenish gray.....	460.0	460.5
Shale, reddish brown.....	460.5	470.0
Shale, light greenish gray.....	470.0	477.0
Shale, medium gray, limy.....	477.0	493.0
Wakarusa Formation:		
Limestone (poor sample), shaly.....	493.0	497.0
Soldier Creek Formation:		
Shale, medium olive gray.....	497.0	503.0

Test Hole #10-U-40
3N 14E 36caca
Richardson County

Location: NE SW NE SW sec. 36, T. 3 N., R. 14 E., 2,112 feet north
 and 1,584 feet east of southwest corner of section.
 Ground elevation: 1,050.0 feet (t) (Dawson 7.5 min. quadrangle)
 Depth to water: 52.8 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey.....	0.0	5.0
Clay, reddish brown.....	5.0	9.0
Sand, clayey, medium.....	9.0	12.0
Gravel, clayey, fine to coarse.....	12.0	36.0
Sand, clayey, white, very fine, slightly gravelly below 75.0 ft.....	36.0	95.0
Permian System - Big Blue Series - Council Grove Group:		
Limestone, brownish gray.....	95.0	95.5
Shale, calcareous, sandy, olive gray.....	95.5	97.0

Test Hole #18-U-40
3N 15E 12cbdd
Richardson County

Location: SE SE NW SW sec. 12, T. 3 N., R. 15 E., 1,584 feet north
 and 1,056 feet east of the southwest corner of section.
 Ground elevation: 1,110.0 feet (t) (Verdon 7.5 min. quadrangle)
 Depth to water: not measured

Depth, in feet
 From To

Quaternary System, undifferentiated:

Soil, clayey, black.....	0.0	2.0
Clay, brown and tan, slightly gravelly with some chalklike material from 21.0 - 32.0 feet.....	2.0	32.0
Clay, sandy, yellow, gray, black, slightly gravelly.	32.0	75.0
Sand, blue, black, clayey, medium, slightly gravelly	75.0	87.0
Clay, sandy, tan, contains shale and limestone fragments below 96.0 ft, slightly gravelly.....	87.0	118.0
Gravel, coarse.....	118.0	122.0

Permian System - Big Blue Series - Admire Group:

Shale, bluish black.....	122.0	126.0
Limestone.....	126.0	

Test Hole #22-A-67
3N 15E 13aaaa
Richardson County

Location: NE corner sec. 13, T. 3 N., R. 15 E., 26 feet south and
 284 feet west of northeast corner.

Ground elevation: 1,101.0 feet (t) (Verdon 7.5 min. quadrangle)

Depth to water: 9.53 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil.....	0.0	1.4
Silt, very clayey, slightly gravelly, dark brown, some iron stain, below 2.0 ft. yellowish brown....	1.4	4.8
Till, clayey, silty, sandy, gravelly, olive yellow, below 5.3 ft. yellowish brown.....	4.8	8.5
Till, clayey, silty, sandy, very calcareous, pale yellow, some pale olive.....	8.5	14.5
Till, clayey, silty, sandy, gravelly, very calcareous, pale yellow, below 15.9 ft. moderately calcareous.....	14.5	23.6
Sand, gravelly, very fine sand to fine gravel.....	23.6	24.8
Till, clayey, silty, sandy, gravelly, moderately calcareous, light olive brown, from 30.0 - 35.7 ft. light yellowish brown, below 35.7 ft. light yellowish gray.....	24.8	36.4
Silt, clayey, limy, light gray.....	36.4	37.9
Till, clayey, silty, sandy, gravelly, moderately calcareous, very dark gray, 39.9 - 41.5 ft. light yellowish brown, below 41.5 ft. gray and olive yellow.....	37.9	44.0
Sand, slightly gravelly, fine sand to fine gravel, some cobbles.....	44.0	45.0
Till, clayey, silty, sandy, gravelly, moderately calcareous, light yellowish gray, yellowish brown and dark gray.....	45.0	49.4
Silt, clayey, moderately calcareous, light olive brown.....	49.4	54.5
Till, clayey, silty, sandy, gravelly, moderately calcareous, dark gray, from 70.3 - 70.5 ft. limy area, below 72.1 ft. gray, some olive gray.....	54.5	72.9
Clay, silty, moderately calcareous, grayish brown, few sand grains.....	72.9	74.0
Silt, moderately clayey, sandy, moderately calcareous, light brownish gray, sand is very fine, below 74.9 ft. light olive gray.....	74.0	77.5
Clay, silty, sandy, moderately calcareous, brown, some yellowish brown.....	77.5	85.0

Silt, moderately clayey, moderately sandy, moderately calcareous, grayish brown.....	85.0	89.8
Sand, very silty, sand is very fine to fine.....	89.8	95.0
Sand, gravelly, very fine sand to medium gravel, below 100.0 ft. much reworked limestone.....	95.0	107.7
Permian System - Big Blue Series - Admire Group:		
Hamlin Formation:		
Stine Member:		
Shale, pale yellow.....	107.7	110.0
Shale, pale olive gray, contains very fine mica.....	110.0	111.0
Shale, light to medium gray, contains very fine mica	111.0	117.5
Shale, medium to dark gray.....	117.5	118.0
Shale, light to medium gray.....	118.0	118.7
Limestone, medium to dark gray, very finely crystalline, contains gastropods, interbedded with light gray shale.....	118.7	119.5
Shale, light to medium gray, with interbedded limestone.....	119.5	120.6
Shale, light gray, contains very fine mica.....	120.6	122.0
Limestone, light brownish gray, very finely crystalline, interbedded with light gray shale....	122.0	123.0
Shale, light gray.....	123.0	125.1
Shale, pale olive, interbedded with light brown, very finely crystalline limestone.....	125.1	125.7
Limestone, light brownish gray, "algal," contains fossils, glauconite, and interbedded light gray shale.....	125.7	127.2
Shale, light greenish gray, contains very fine mica.	127.2	128.0
Shale, olive brown, contains very fine mica.....	128.0	132.5
Shale, dark gray to black.....	132.5	133.5
Five Point Formation:		
Limestone, light tan, very finely crystalline, "algal".....	133.5	134.5
West Branch Formation:		
Shale, light gray, contains very fine mica.....	134.5	139.0
Shale, light gray, with some interbedded medium gray limestone.....	139.0	140.0
Shale, light greenish gray, with interbedded light greenish gray limestone.....	140.0	147.0
Shale, medium gray, mottled with greenish gray, and interbedded with medium gray limestone.....	147.0	148.2
Limestone, light and medium gray, mottled with very finely crystalline light greenish gray shale.....	148.2	159.0
Falls City Formation:		
Lehmer Member:		
Limestone, medium gray, very finely crystalline to dense.....	159.0	160.1

Limestone, medium to dark gray, "pebbly," contains pyrite and interbedded with shale.....	160.1	162.0
Reserve Member:		
Shale, light gray.....	162.0	163.8
Shale, medium to dark gray.....	163.8	166.0
Miles Member:		
Limestone, medium gray, very finely crystalline, "pebbly".....	166.0	168.2
Shale, light greenish gray, interbedded with light brownish gray, very finely crystalline limestone..	168.2	169.7
Onaga Formation:		
Hauxby Member:		
Shale, light greenish gray, with some light gray limestone.....	169.7	173.5
Shale, light greenish gray.....	173.5	174.5
Shale, light greenish gray, with some pale red.....	174.5	178.8
Shale, light gray and light greenish gray.....	178.8	179.6
Limestone, light gray, mottled with greenish gray, very finely crystalline.....	179.6	180.5

Test Hole #24-B-67
3N 15E 25aaba
Richardson County

Location: NE NW NE NE sec. 25, T. 3 N., R. 15 E., 75 feet south and
 754 feet west of northeast corner.

Ground elevation: 1,146.0 feet (t) (Verdon 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill.....	0.0	0.5
Clay, moderately silty, slightly sandy, dark brown, below 1.0 ft. brown, sand is very fine.....	0.5	4.0
Clay, very silty, moderately sandy, brownish yellow, mottled with gray and black.....	4.0	5.0
Silt, moderately sandy, slightly clayey, light brownish yellow, mottled with red and brown, sand is very fine to fine.....	5.0	11.5
Silt, very sandy, slightly clayey, pale olive, sand is very fine to fine, below 15.5 ft. yellowish brown.....	11.5	17.5
Clay, moderately sandy, yellowish brown, some pale brown, sand is very fine to fine.....	17.5	28.5
Clay, slightly silty, slightly sandy, light gray, sand is very fine to fine, below 34.5 ft. moderately sandy, white, sand is very fine to coarse, with trace of fine gravel.....	28.5	35.0
Till, clayey, silty, sandy, gravelly, slight to very calcareous, light yellowish brown, below 37.5 ft. marly.....	35.0	37.5
Till, clayey, silty, sandy, gravelly, gray, moderate to in places very to slightly calcareous, some mottled reddish brown and black.....	37.5	59.0
Sand, gravelly, very fine sand to medium gravel, rare gravel.....	59.0	59.8
Till, clayey, sandy, moderately calcareous, in places slightly calcareous, pale olive, below 60.0 ft. gravelly, below 61.5 ft. yellowish brown, with light gray, pale olive and brownish yellow.....	59.8	70.0
Till, clayey, silty, sandy, gravelly, moderately calcareous, light gray, below 72.5 ft. slightly calcareous, below 75.5 ft. olive yellow with some yellowish brown and gray.....	70.0	90.0
Till, clayey, silty, sandy, gravelly, moderately calcareous, in places slightly calcareous, light gray, little reddish brown mottling.....	90.0	98.0

Sand, very fine to medium, below 105.0 ft. very fine to coarse, little very coarse.....	98.0	108.0
Silt, very sandy, slightly clayey, gray, sand is very fine to medium.....	108.0	109.5
Sand, fine to medium.....	109.5	110.0
Till, clayey, silty, sandy, gravelly, moderately calcareous, light gray and reddish brown, below 112.5 ft. dark gray.....	110.0	132.0
Clay, silty, sandy, slightly calcareous, dark gray..	132.0	134.0
Sand, silty, slightly calcareous, dark gray.....	134.0	141.0
Silt, very sandy, slightly clayey, olive, very fine.	141.0	144.0
Sand, very fine to very coarse.....	144.0	144.5
Silt, very sandy, slightly clayey, slightly calcareous, gray, sand is very fine to fine.....	144.5	155.0
Sand, very fine to coarse.....	155.0	164.0
Silt, very sandy, slightly calcareous, gray, from 180.0 - 185.0 ft. and 200.0 205.0 ft. some pyrite, below 226.0 ft. wood fibers.....	164.0	232.0
Gravel, sandy, very coarse sand to coarse gravel, below 240.0 ft. coarse sand to coarse gravel.....	232.0	248.3
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Pony Creek - Plumb Members:		
Shale, reddish brown, contains very fine mica, sandy.....	248.3	251.0
Shale, brownish gray, mottled with pale red, contains very fine mica, sandy.....	251.0	254.5
Shale, light gray, contains very fine mica, sandy...	254.5	255.0
Shale, medium to dark gray.....	255.0	258.4
Limestone, dark gray, impure, spines, contains fossil fragments.....	258.4	258.7
Nebraska City Member:		
Shale, light gray.....	258.7	259.0
Limestone, medium gray, very finely crystalline, contains crinoids and brachiopods.....	259.0	259.9
Root Formation:		
French Creek Member:		
Coal.....	259.9	260.1
Shale, medium gray, contains very fine mica.....	260.1	265.0
Siltstone and Sandstone, light gray, very finely grained, contains very fine mica, with black carbonaceous streaks.....	265.0	274.5
Jim Creek Member:		
Limestone, medium gray, very finely crystalline, contains crinoids and brachiopods.....	274.5	275.2
Shale, light gray.....	275.2	276.3
Limestone, light to medium gray, very finely crystalline, contains crinoids and brachiopods....	276.3	276.5

Friedrich Member:

Shale, light to medium gray.....	276.5	280.0
Shale, light gray.....	280.0	285.0
Shale, greenish gray, with some interbedded very thin limestone seams.....	285.0	287.3
Shale, light to medium gray, mottled with greenish gray.....	287.3	290.0
Shale, light greenish gray.....	290.0	291.0
Shale, pale reddish gray, mottled with light greenish gray.....	291.0	295.0
Shale, reddish gray.....	295.0	295.7
Shale, reddish gray, interbedded with light greenish gray shale and limestone.....	295.7	296.0

Stotler Formation:**Grandhaven Member:**

Limestone, pale reddish gray, very finely crystalline, interbedded with greenish red shale..	296.0	296.3
Limestone, light greenish gray, mottled with red, very finely crystalline, interbedded with shale...	296.3	297.1

Dry Member:

Shale, light gray.....	297.1	300.0
Shale, pale olive.....	300.0	304.0
Shale, light to medium gray.....	304.0	305.0
Shale, medium red.....	305.0	307.7
Shale, reddish brown and light greenish gray, with some yellowish brown limestone.....	307.7	309.0
Shale, reddish brown, mottled with yellowish brown..	309.0	311.0
Shale, light gray, mottled with pale red.....	311.0	314.0
Shale, light gray, clayey.....	314.0	320.5

Test Hole #149-40
3N 15E 29adcc
Richardson County

Location: SW SW SE NE sec. 29, T. 3 N., R. 15 E., on north edge of road, 1,548 feet west and 2,640 feet south of northeast corner of section.

Ground elevation: 955.0 feet (t) (Dawson 7.5 min. quadrangle)

Depth to water: 16.02 feet

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Road fill, soil, clayey, black.....	0.0	6.0
Clay, brownish gray, with rusty streaks.....	6.0	17.0
Clay, silty, greenish gray.....	17.0	37.0
Sand, silty, greenish gray, fine to coarse, slightly gravelly below 44.0 ft.....	37.0	48.0
Limestone fragments and shale chips, water-worn.....	48.0	49.0
Clay, silty, sandy, greenish gray.....	49.0	60.0
Sand, slightly silty, greenish gray, fine.....	60.0	100.0
Silt, sandy, dark gray.....	100.0	106.0
Gravel, limestone and flint chips.....	106.0	108.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Shale, clayey, sandy, greenish gray, contains mica..	108.0	111.0
Shale, red.....	111.0	113.0

Test Hole #25-B-67
3N 15E 36ddddd
Richardson County

Location: SE corner sec. 36, T. 3 N., R. 15 E., 7 feet north and
 151 feet west of southeast corner.

Ground elevation: 1,097.0 feet (t) (Falls City NW 7.5 min.
 quadrangle)

Depth to water: 20.67 feet

Depth, in feet
 From To

Quaternary System, undifferentiated:

Road fill.....	0.0	2.0
Clay, silty, slightly sandy, yellowish brown, sand is very fine to fine.....	2.0	5.0
Silt, moderately sandy, slightly clayey, brownish yellow, sand is very fine to fine, below 11.5 ft. moderately clayey, yellowish brown.....	5.0	18.0
Till, clayey, silty, sandy, gravelly, light yellowish brown.....	18.0	19.0
Gravel, sandy, fine sand to coarse gravel.....	19.0	20.7
Till, clayey, silty, sandy, gravelly, slightly calcareous, pale olive, some olive yellow and red mottling.....	20.7	40.0
Till, clayey, silty, sandy, gravelly, slightly to moderately calcareous, pale olive, some yellow and gray mottling.....	40.0	52.5
Till, clayey, silty, sandy, slightly calcareous, light olive brown, some light yellowish brown.....	52.5	70.0
Silt, moderately sandy, slightly clayey, moderately calcareous, pale olive, below 70.0 ft. slightly calcareous.....	70.0	77.0
Sand, very fine to fine, from 80.0 - 85.0 ft. little medium sand.....	77.0	111.0
Clay, silty, pale olive, below 115.0 slightly sandy, yellowish brown, sand is very fine to fine.....	111.0	116.8
Clay, silty, slightly sandy, pale olive, sand is very fine to fine.....	116.8	120.0

Permian System - Big Blue Series - Admire Group:

West Branch Formation:

Shale, light greenish gray, interbedded with light greenish gray limestone.....	120.0	123.0
Shale, pale reddish gray, mottled with light greenish gray.....	123.0	124.0
Shale, very light greenish gray, with pale yellow soft limestone interbedded.....	124.0	125.7
Limestone, light gray, with pale yellow soft interbedded shale.....	125.7	129.0

Limestone, medium gray, very finely crystalline, soft, interbedded with pale yellow shale.....	129.0	135.0
Shale, pale olive, mottled with yellow.....	135.0	138.0
Falls City Formation:		
Lehmer Member:		
Limestone, pale yellow, very finely crystalline.....	138.0	140.0
Reserve Member:		
Shale, medium to dark gray, clayey.....	140.0	145.3
Miles Member:		
Limestone, medium bluish gray, "black inclusions," pebbly.....	145.3	146.3
Shale, light greenish gray, and interbedded light greenish gray limestone.....	146.3	147.8
Shale, light greenish gray, mottled with pale red, and interbedded with light greenish gray limestone	147.8	148.3
Onaga Formation:		
Hauxby Member:		
Limestone, pale yellow, very finely crystalline, soft, with interbedded light greenish gray shale..	148.3	150.0
Shale, light greenish gray, with interbedded light greenish gray limestone.....	150.0	152.5
Shale, light greenish gray.....	152.5	155.3
Shale, light greenish gray, trace of red mottling, hard.....	155.3	160.0
Aspinwall Member:		
Limestone, light greenish gray, very finely crystalline, fossils, shaly, with interbedded greenish gray shale.....	160.0	161.3
Limestone, light gray, very finely crystalline.....	161.3	161.5
Towle Member:		
Shale, light to medium gray.....	161.5	163.8
Shale, reddish gray, with some interbedded white lime.....	163.8	165.0
Shale, reddish brown, mottled with yellowish brown, contains very fine mica.....	165.0	169.0
Shale, pale reddish brown, mottled with yellowish brown and light gray.....	169.0	170.0
Shale, olive, mottled with yellowish brown.....	170.0	172.0
Pennsylvanian System - Virgil Series - Wabaunsee Group:		
Wood Siding Formation:		
Brownville Member:		
Limestone, light greenish gray, very finely crystalline, contains glauconite and brachiopods, and light greenish gray shale.....	172.0	174.6
Pony Creek - Plumb Members:		
Siltstone, light greenish gray, very finely grained, contains very fine mica.....	174.6	175.0

Siltstone, reddish gray, interbedded with light greenish gray, very finely grained, contains very fine mica.....	175.0	176.0
Siltstone, light greenish gray, very finely grained, contains very fine mica.....	176.0	176.1
Siltstone, pale reddish gray, and interbedded light greenish gray, very finely grained, contains very fine mica.....	176.1	177.0
Siltstone, light greenish gray, mottled with red, very finely grained, contains very fine mica.....	177.0	180.0
Shale, light greenish gray, sandy, contains very fine mica.....	180.0	180.5

Test Hole #19-U-40
3N 16E 27adad
Richardson County

Location: SE NE SE NE sec. 27, T. 3 N., R. 16 E., 1,848 feet south
 and 150 feet west of northeast corner of section.

Ground elevation: 1,160.0 feet (t) (Barada 7.5 min. quadrangle)

Depth to water: not measured

	<u>Depth, in feet</u>	
	From	To
Quaternary System, undifferentiated:		
Soil, clayey, black.....	0.0	2.0
Clay, tan.....	2.0	59.0
Clay, silty, gray.....	59.0	89.0
Clay, silty, brown, contains chalklike material.....	89.0	97.0
Clay, yellow, brown and gray, slightly gravelly.....	97.0	105.0
Clay, sandy, yellow, brown to gray, some gravel.....	105.0	128.0
Clay, sandy, yellowish brown, some gravel.....	128.0	150.0
Clay, bluish gray and brown, some gravel.....	150.0	178.0
Permian System - Virgil Series - Wabaunsee Group:		
Shale.....	178.0	183.0